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Getting to Zero: An Evaluation of Santa Clara County's HIV Prevention Program in Comparison to Selected Counties

Nupur Rathore
San Jose State University

Getting to Zero: An Evaluation of Santa Clara County's HIV Prevention Program in Comparison to Selected Counties

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Nupur Rathore

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Prof. Frances Edwards, Ph.D.

Adviser

The Graduate School

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The HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome) epidemic has emerged as one of the major public health issues in the last 40 years globally (Ortblad, Lozano, & Murray, 2013). HIV prevention programs have been in place since the inception of the disease and have evolved over the years. In 2011, Joint United Nations Programme on HIV and AIDS (UNAIDS) adopted a new global vision of "Getting to Zero (GTZ)" for the HIV prevention initiatives (Lawn, 2012). GTZ campaign entailed a vision of a future generation with "Zero new HIV infections, Zero discrimination and Zero AIDS-related deaths" (Buse, Blackshaw, & Ndayisaba, 2012, pg.1). Researchers believe that the vision of GTZ is now firmly grounded in science (El-Sadr, Harripersaud, & Bayer, 2014). Between 2012 - 2014, multiple clinical trials across the world provided strong evidence for the use of antiretroviral drugs for both treatment and prevention. This evidence paved a new direction for the HIV prevention programs worldwide (El-Sadr, Harripersaud, & Bayer, 2014). The medical advancements helped transform HIV/AIDS from a fatal disease to a chronic condition (Deeks, Lewin, & Havlir, 2013). Researchers believe that the global response is at a critical juncture in the fight against this deadly epidemic (Cock, Jaffe, & Curran, 2012). All the necessary tools – effective prevention methods, improved HIV testing, universal access to treatment, robust data collection system, global support, and political will – are in place to achieve the vision of GTZ (Buse, Blackshaw, & Ndayisaba, 2012).

The vision of GTZ served as a blueprint for all the HIV prevention programs across the globe. In 2015, the United States updated its National HIV/AIDS Strategy (NHAS) to adopt the goals of GTZ (U.S. Department of Health & Human Services, 2017). Many states across the nation also updated their HIV prevention programs to adopt the common theme of GTZ. The State of

California updated the California's Integrated HIV Prevention Plan in 2016 to articulate the vision of GTZ (California Department of Public Health, 2019). Counties within California were free to either follow the state plan or to adopt an independent local plan based on their unique needs and resources. Santa Clara County (SCC) adopted the vision of GTZ in 2016, as a four-year initiative that will strive for zero new infections, zero deaths related to HIV/AIDS, and zero HIV/AIDS related stigma and discrimination. In SCC, GTZ is a collaborative effort between the Department of Public Health and community partners, supported by additional funding provided by the Santa Clara County Board of Supervisors (Santa Clara County, 2019).

Research Question

This research project compared SCC with nine other counties in California to determine, how SCC's outcome of its GTZ program varies in comparison to other selected counties? The project also focused on determining how SCC's spending for its GTZ differed from the other selected counties?

BACKGROUND

Human immunodeficiency virus (HIV) attacks the cells (CD4 cells) that help the body to fight infections (U.S Department of Health and Human Services (HHS), 2019a). This virus reduces the body's immunity that results in higher vulnerability to other infections and diseases (HHS, 2019a). Acquired Immunodeficiency Syndrome (AIDS) is the last stage of HIV infection that occurs when the count of CD4 cells falls below 200 cells per cubic millimeter of blood (HHS, 2019a). At this stage of the infection the body's immune system is significantly compromised (HHS, 2019a). The transmission of the virus is found to occur through multiple routes such as, i) through unprotected sexual intercourse, ii) by sharing syringes, iii) perinatally from mother to child during pregnancy, childbirth and breastfeeding (HHS, 2019b). In rare circumstances, transmission can also occur during, i) oral sex, ii) receiving blood transfusions, iii) contact between broken skin, or mucous membranes with HIV-infected blood, iv) deep, open-mouth kissing if both partners have sores or bleeding gums and blood from the HIV-positive partner gets into the bloodstream of the HIV-negative partner (HHS, 2019b). The human body cannot get rid of the virus on its own and no effective cure exists. Effectively, once a person is infected with HIV, it persists for life (HHS, 2019a).

Subsequent to the identification of the first HIV case in 1981, constant efforts have been made globally to find effective methods to control this deadly epidemic (Cock, Jaffe & Curran, 2012). However, the HIV/AIDS epidemic evolved over time and has become one of the most important public health issues worldwide (Haghdoost & Karamouzian, 2012).

The disease impacts all countries across the world regardless of their socio-economic status or development level (Haghdoost & Karamouzian, 2012). About 78 million people have suffered from HIV and approximately 35 million people have died as a result of AIDS-related illnesses

across the globe (Fauci, Redfield, Sigounas, Weahkee, & Giroir, 2019). In the United States alone it is estimated that more than 700, 000 people have died as a result of HIV/AIDS since the disease was first recognized in 1981 (Centre for Disease Control and Prevention (CDC), 2019; Fauci, et.al, 2019). According to the Joint United Nations Programme on HIV and AIDS' (UNAIDS) 2019 report, currently there are approximately 37.9 million people across the globe who are suffering with the disease. Of this, approximately 1.7 million people were those who were newly infected in 2018 (UNAIDS, 2019).

The United States' data, based on the report from the CDC, indicates that by the end of 2016 there were approximately 1.1 million people living with HIV in the US (CDC, 2019b). One in every seven (~14%) of them were estimated to be unaware of their infected status (CDC, 2019b; Fauci et.al, 2019). It is estimated that 23% of the new infections get transmitted by individuals who are unaware of their infection, while approximately 69% are transmitted by those who are diagnosed but are not in care (Fauci et.al, 2019). In 2018, 37,832 cases of new infections were identified in the US (CDC, 2019b). In light of the above facts, one very critical role of any HIV prevention program is to spread awareness and reduce stigma associated with the disease. Such efforts are imperative to encourage people to come forward, get tested, and be retained in care (Fauci et.al, 2019).

Interestingly, the distribution of this disease is not equal across demographics and a few core populations are observed to be at a higher risk (Ortblad, Lozano, & Murray, 2013). Global data shows that the vast majority of the population suffering from disease belong to the low and middle-income countries (Ortblad, Lozano, & Murray, 2013). Disproportionately, a large number of cases exist in the African region, followed by Asia and the Pacific regions (CDC, 2019). Within the US, data shows higher prevalence in the South, followed by the six US territories, the

Northeast, West Coast, and the Midwest region (CDC, 2019a). With respect to the core population, data shows that HIV disproportionately affects the sex workers, men who have sex with men, people who inject drugs and the transgender population across the world (CDC, 2019a). In the US, data reveals that the highest prevalence of the disease is among the gay and bisexual men, who account for 66% of all the diagnosis, followed by heterosexuals who accounted for 24% and the people who inject drugs accounting for 6% of all the HIV diagnosis (CDC, 2019a). The US HIV Surveillance Report reveals disparity in distribution based on some other variables as well (CDC, 2019b). Based on race and ethnicity, the largest number of HIV cases have been observed in the African- American and the Hispanic/Latino populations (CDC, 2019b). Based on the age group, the prevalence is high among the people between the ages of 25 to 34 years (CDC, 2019b).

According to the World Health Organization 2019 fact sheet, as a result of collective global efforts in response to HIV, coverage of services has been steadily increasing. In 2018, 62% of adults and 54% of children living with HIV in low- and middle-income countries were receiving lifelong antiretroviral therapy (ART) (WHO, 2019). At the end of 2018, an estimated 79% of people living with HIV knew their status. 62% were receiving ART and 53% had achieved suppression of the HIV virus with no risk of infecting others (WHO, 2019).

HIV Treatment

Zidovudine was the first antiretroviral drug that was developed in 1987 (Palmisano & Vella, 2011). Since then a significant stride has been made with the development of multiple drugs that exist today (Palmisano & Vella, 2011). One of the earliest challenges that the health fraternity faced was the amount of time for which a certain drug remained effective. It was observed that patients were developing drug resistance very soon with the medications that were in place during that time, so as a result the doctors had to constantly change the medication (Palmisano & Vella, 2011).

This practice led patients to becoming resistant to multiple drugs eventually, leading to a point where no effective medication was left that could control the disease after a few years of treatment (Palmisano & Vella, 2011).

During 1995-96 "Highly Active Antiretroviral Therapy" known as HAART (today, called ART only) was developed (Palmisano & Vella, 2011). Scientists discovered that using combination antiretroviral agents prevented development of drug resistance and improved the effectiveness of the drug (Palmisano & Vella, 2011). Today there are more than 30 combination antiretroviral agents that have been approved by the Food and Drug Administration (FDA) (HHS, 2020). Even though effective medication existed since the development of HAART, at the end of 2007 it was estimated that therapy was still reaching only 12% of those infected, and only the sickest were considered eligible for treatment (Chan, n.d).

Another big challenge associated with the drug was the cost of the medication (Chan, n.d). Significant court rulings in Brazil and India around 2009, aided by vocal civil society groups, opened the market for low-cost generic antiretroviral medicines (Chan, n.d). The WHO assessed the safety and efficacy and also kept a close watch on the overall quality standards of these low-cost drugs (Chan, n.d). Gradually, confidence in the quality of low-cost generics, prequalified by WHO, increased (Chan, n.d). As access to low-cost treatment increased, it was observed that adults with HIV on long-term combination therapy could reach a life expectancy comparable with that in the general population (Chan, n.d). In poor communities, what had once been a death sentence was transformed into a disease that could be managed like a chronic condition (Chan, n.d).

A big leap forward occurred in 2011, three decades after the first reports of AIDS were published, when a groundbreaking trial conducted by the US National Institutes of Health revealed that antiretroviral therapy can also contribute to HIV prevention (Chan, n.d). In 2012, WHO made

its first recommendation on using pre-exposure prophylaxis (PrEP) as an effective approach for HIV prevention (Chan, n.d).

Treatment as Prevention (TasP)

Even though the disease is still not curable, it was identified that by taking timely HIV medication people with HIV or at-risk of HIV can live a long and healthy life like any other uninfected individual (HHS, 2019c). The medications can suppress the viral load (the amount of HIV virus in blood) to an extremely low level so that the virus is no longer detectable during the blood tests (HHS, 2019c). Clinical trials ascertain that if a person can maintain an undetectable viral load he is untransmittable, which means that he can no longer transmit the HIV virus to his/her sexual partners (HHS, 2019c). U=U (Undetectable = Untransmittable) is a reality today (UNAIDS, 2018). Scientists at National Institute of Allergy and Infectious Disease (2019), believe that "treatment for HIV is a powerful arrow in the quiver of HIV prevention tools" (pg. 1).

Pre-Exposure Prophylaxis (PrEP)

PrEP is a prevention method for the people who belong to an at-risk community or are at-risk due to any other reason (HHS, 2019c). They can take a prevention pill daily to reduce their risk of acquiring the virus, if they are exposed to it (HHS, 2019c). Multiple trials have demonstrated that PrEP reduces the risk of getting HIV through sex by about 99%, though safe sex practices are highly recommended. Among people who inject drugs, it is estimated that PrEP reduces the risk of HIV by at least 74% (CDC, n.d.a). Taking the prevention pill daily, as prescribed, remains a very critical part of the prevention therapy (HHS, 2019c and CDC, n.d.a). According to the U.S Department of Health and Human Services, no serious side-effects have been reported among people who have been on PrEP therapy for 5 years (HHS, 2019 and CDC, n.d.a).

Truvada was the first drug approved by the U.S. Food and Drug Administration (FDA), that can be prescribed as PrEP to all individuals who are at high risk (HHS, 2012). Truvada was approved by the FDA in July, 2012 (HHS, 2012). On October 3, 2019 another drug, "Descovy ", was approved by the FDA to be used for PrEP (FDA, 2019). However, the efficacy of Descovy is limited to some adults and adolescents, but it is not approved for all those who are at risk of getting HIV through receptive vaginal sex, since the effectiveness of the drug in this population has not been evaluated yet (FDA, 2019).

Post-Exposure Prophylaxis (PEP)

Post-exposure Prophylaxis (PEP) simply means taking ART after a potential exposure to the disease, to prevent development of the infection (CDC, n.d.b). CDC recommends that if a person suspects a possible HIV-exposure, he should contact the health provider or visit the emergency room immediately (CDC, n.d.b). It is recommended that PEP should be started within 72 hours for best results. The person on PEP is required to take the medication for 28 days with intermittent testing for viral-load (CDC, n.d.b). PEP is effective in preventing HIV infection when it is taken correctly, but has not been proven to be 100% effective yet (CDC, n.d.b). However, no life-threatening side effects have been reported among people who have been receiving PEP (CDC, n.d.b). The health officials stress the fact that PEP should be used only in emergency situations. They do not recommend PEP as a suitable alternative for the cases at high-risk of frequent exposure to HIV. PrEP is the recommendation in those scenarios (CDC, n.d.b).

The health community believes that the availability of PrEP and PEP tools will provide a powerful incentive for people to get tested for HIV exposure, and immediately start on therapy (Chan, n.d). It is also believed that development of a prevention alternative will play a critical role in reducing the stigma associated with the disease (NIH, 2019).

Guidelines to start the treatment

Developing guidelines around the timeline to start the treatment (at what stage of disease progression) has played a very instrumental role in the fight against this deadly disease (Palmisano & Vella, 2011). Though effective medication has been available for a long time, it had limited adoption due to the dilemma with the use of the drug, as the HIV treatment itself had significant side-effects (Palmisano & Vella, 2011).

The World Health Organization (WHO) guidelines for initiating ART dramatically evolved over time (Plazy, Dabis, Naidu, Orne-Gliemann, Barnighausen & Dray-Spira, 2015). In the beginning, multiple serious side effects were reported in patients on ART drugs. Hence ART was administered when a HIV-infected person developed symptoms and was in a moderate or advanced stage of infection (WHO Guidelines, 2002). The aim of the treatment during this era was to limit disease progression and mortality. After multiple trials, evidence suggested less side-effects with the treatment (Plazy, et. al, 2015). The WHO guidelines were revised in 2010, health professionals were now able to start a person with the treatment earlier (guided by the CD4 count) when most people were still asymptomatic (Plazy, et. al, 2015). Trials continued to monitor the effectiveness of the drug with respect to the side-effects. The WHO guidelines of 2013 expanded the ART eligibility criteria at CD4 count <500 cells/μL (Plazy, et. al, 2015). However, a momentous change was made in 2015, when the guidelines were revised with recommendation to start ART medication in everyone living with HIV at any CD4 cell count, in other words, as soon as diagnosed (WHO, 2015).

Getting to Zero

With the invention of effective antiretroviral medication (HAART), the new HIV infections cases declined by 17% between 2001 and 2008 across the globe (UNAIDS. 2010). By the end of 2009,

an estimated 5.25 million people in low- and middle-income countries were receiving life-prolonging antiretroviral therapy, compared to 0.4 million in 2003 (UNAIDS, 2010). Between 2004 and 2008, annual AIDS-related deaths were also reported to decline from 2.2 million to 2.0 million (UNAIDS, 2010).

During the same time window, HIV prevention programs were gathering momentum. New institutions such as the Joint United Nations Programme on HIV/AIDS (UNAIDS) in 1996, the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) in 2002 and the US President's Emergency Plan for AIDS Relief (PEPFAR) in 2002 were formed, to specifically address HIV related issues, and minimize funding disparity across nations (Ortblad, Lozano, & Murray, 2013).

UNAIDS believed that the world has changed fundamentally since the historic commitments to the Millennium Development Goals and the 2001 Declaration of Commitment on HIV/AIDS were made (UNAIDS, 2010). According to Michel Sidibé, UNAIDS Executive Director, in this rapidly changing context, "the global HIV response was approaching a pivotal juncture" (UNAIDS, 2010, pg. 5). The UNAIDS called for a strategy of transition that aimed to see fewer people newly infected than are newly placed on treatment (UNAIDS, 2010). The officials believed that doing so would require a decisive global action which should be guided by a groundbreaking vision (UNAIDS, 2010). In 2011, UNAIDS laid the foundation of a global plan of "Getting to Zero (GTZ)" that established a blueprint for an AIDS-free generation with "Zero new HIV infections, Zero-AIDS related deaths underpinned by Zero discrimination" (WHO, 2011).

To achieve the goal of GTZ, UNAIDS laid the targets for 2011-2015 as, i) reduce new infections by 50% among young people aged 15–24 years, ii) reduce new HIV infections in children by 90%, and iii) reduce HIV-related mortality by 25% (WHO, 2011 and UNAIDS, 2010).

In 2013, the epidemic reached its tipping point (Chan, n.d). For the first time, the WHO report highlighted that the number of people newly started on antiretroviral therapy surpassed the number of new infections (Chan, n.d). A powerful momentum was being built towards a new narrative on HIV treatment with the evolution of TasP strategy (UNAIDS, 2014). GTZ goals were revised in 2015, as a result of these promising advancements. UNAIDS established a new ambitious goal which included i) by 2020, 90% of all people living with HIV will know their HIV status, ii) by 2020, 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy, and iii) by 2020, 90% of all people receiving antiretroviral therapy will have viral suppression (UNAIDS, 2014). The new goals established a new benchmark for the Continuum of Care measure to achieve the goal of zero new HIV infections, zero-AIDS related deaths underpinned by zero discrimination (UNAIDS, 2014).

With GTZ, a concerted global action emerged that broadened the narrow focus from merely reducing the individual risk and providing treatment. Social and cultural components, political limitations, legal restraints and other contextual factors that increase vulnerability to HIV were addressed (Ortblad, Lozano, & Murray, 2013).

United States' response to HIV/AIDS

On July 13, 2010 the Obama Administration laid down the foundation of the first National HIV/AIDS Strategy (NHAS) for the United States (HHS, 2017). NHAS acted as a guide for the country's response to the deadly epidemic. The three primary goals of the plan were to i) reduce the number of people who become infected with HIV, ii) increase access to care and optimize health outcomes for people living with HIV, and iii) reduce HIV-related health disparities (HHS, 2017). In light of the significant scientific/medical advancements that took place between 2010-2015, President Barak Obama signed an Executive Order to update NHAS for the years 2015

through 2020 (HHS, 2017). Experts believed that science exists to achieve the ambitious goal of GTZ and dream for an AIDS-free generation to exist in the future (HHS, 2017). Followed by the updated national response and significant medical advancements, each state revised its existing HIV prevention program's plans to align with the goals, objectives and strategies adopted by the NHAS to achieve the goal of GTZ.

In the State of the Union Address on February 5, 2019, President Donald J. Trump announced his administration's goal to end the HIV epidemic in the United States within the next 10 years to achieve the goal of GTZ through, *Ending the HIV Epidemic: A Plan for America* (HHS, 2020). The President proposed $291 million in the FY2020 HHS budget to begin his administration's multiyear initiative focused on ending the HIV epidemic in America by 2030 (HHS, 2020). The *Ending the HIV Epidemic: A Plan for America* has laid forward a goal for reducing the infection by 75% in the next 5 years and by 90% by 2030 (HHS, 2020).

HIV in California

Epidemiology of HIV in California

According to the California Department of Public Health: Office of AIDS (CDPH: OA), CDC report, approximately 153,154 people were estimated to be living with HIV in California in 2017 (CDPH: OA, 2017), out of which 4,791 people were those who were newly diagnosed with the disease (CDPH: OA, 2017). CDC has also highlighted that there are eight counties in California that contributed 75% of the new HIV diagnoses. The highest burdened counties included Los Angeles, San Francisco, San Diego, Orange, Riverside, Alameda, San Bernardino, and Fresno (CDPH: OA, 2017). The disease was found to be notably concentrated in men who have sex with men (MSM), along with injection drug use (CDPH: OA, 2017). It was also reported that more than 52% of the people newly diagnosed with HIV in California were individuals between 20-34 years

of age (CDPH: OA, 2017). The CDC report highlighted that in 2017, California ranked second in the country for both the highest number of people newly diagnosed and the highest number of people living with HIV (CDPH: OA, 2017).

California's Integrated HIV Surveillance, Prevention and Care Plan

Consistent with the National HIV/AIDS Strategy, California set its own 2021 goals to address the HIV epidemic through laying the foundation of GTZ (California Department of Public Health: Office of Aids (CDPH: OA), 2016). The State of California adopted *California's Integrated Surveillance, Prevention and Care Plan in 2016* to articulate the vision for GTZ in California (CDPH: OA, 2016). *California's Integrated Plan* uses the NHAS as its organizing framework, and includes goals, objectives, and strategies to achieve a more coordinated and effective response to the HIV epidemic in California (CDPH: OA, 2016). The plan also served as a vision for the entire state. The counties were free to follow the state plan, or adopt a more detailed local plan based on their unique needs and resources (CDPH: OA, 2016).

According to CDPH: OA (2016), the integrated plan holds a vision that "Getting to Zero is within reach in California. This means getting to a time when there are Zero New HIV infections, Zero AIDS-related Deaths; and Zero Stigma and Discrimination against People Living with HIV (PLWH)" (Pg. iv). The goals laid forward in the plan include, i) reduce new HIV infections in California; ii) increase access to care and improve health outcomes for PLWH in California; iii) reduce HIV-related disparities and health inequities in California; and iv) achieve a more coordinated statewide response to the HIV epidemic (CDPH: OA, 2016 pg. 4).

Santa Clara County (SCC): Getting to Zero Plan

The County of Santa Clara works in collaboration with the state to follow California's Integrated Surveillance, Prevention and Care Plan (CDPH: OA, 2016). However, to accelerate their AIDS

response the County of Santa Clara's Public Health Department (SCC-PHD) proposed to adopt a local GTZ plan for the county based on its local needs (SCC: PHD, 2015).

Based on the local needs assessment report of 2015, submitted by the PHD to the Board of Supervisors, it was concluded that while SCC was performing significantly better than the national average, still nearly 30% of people living with HIV were not engaged in medical care for their disease (SCC: PHD, 2015). Some did not know that they were infected. Others were not remaining in care after they tested positive (SCC: PHD, 2015). The report highlighted that the rate of newly diagnosed and reported cases of HIV locally grew from 8.5 cases per 100,000 residents in 2013 up to 10 cases per 100,000 in 2014 (SCC: PHD, 2015). This change was driven primarily by a 20% increase among males age 13 and older, including a 46% increase among the Latino males (SCC: PHD, 2015). The number of MSM newly diagnosed with HIV climbed from 75 cases in 2013 to 106 cases in 2014 (SCC: PHD, 2015). The SCC-PHD also assessed that there were significant gaps in knowledge about PrEP and PEP among many providers and patients who could benefit from the medication (SCC: PHD, 2015). Furthermore, the population at highest risk for HIV was evolving and new outreach strategies were needed to be developed to ensure better results (SCC: PHD, 2015).

Based on the assessment, the PHD suggested to undertake a countywide GTZ campaign to work more closely on the needs of the county along with the state plan (SCC: PHD, 2015). The local plan aims to raise awareness; educating providers and consumers about PrEP and PEP, ensuring that testing and treatment guidelines are being followed consistently throughout the county, ensuring that universal screening guidelines are being followed consistently, reducing barriers to retention in care for HIV positive individuals, working with school districts on HIV

education and prevention, and expanding sexually transmitted disease (STD) clinic capacity as needed (SCC: PHD, 2015).

On February 9, 2016, the Board of Supervisors accepted a PHD report, outlining steps to operationalize a "Getting to Zero" initiative in the county, built on a comprehensive, collective impact-informed planning process (SCC: PHD, 2016a). Over the next few months a core GTZ planning group, composed of PHD, Office of LGBTQ Affairs, HIV Planning Council, and the Health Trust, convened working sessions and a community forum to finalize GTZ goals, focus areas, and strategies (SCC: PHD, 2016a).

The board of supervisors officially launched a four-year "Silicon Valley, County of Santa Clara Getting to Zero Initiative (GTZ)" (SCC: PHD, 2016b). To prevent and respond to the HIV/AIDS related issues in the county in a more effective manner, SCC-PHD adopted a "Collective impact model" for the implementation of this program (SCC: GTZ, n.d.b). According to the model, SCC-PHD works in collaboration with other community partners, which include HIV/AIDS service providers, healthcare organizations, advocacy groups, and other community-based organizations (SCC: GTZ, n.d.b). The GTZ initiative is a charge under the auspices of the SCC-PHD, with delegation of primary implementation awarded to a community partner, The Health Trust (SCC: GTZ, n.d.b).

In September 2016, the Board of Supervisors approved funding for the GTZ efforts in the form of mini-grants each year to promote community agencies' ability to recognize and respond to HIV prevention needs in SCC (SCC: GTZ, n.d.a). These grants were awarded each year from 2016 through 2020 (SCC: GTZ, n.d.a).

The vision of the program was "Santa Clara County without new HIV/AIDS cases and optimal health for people living with HIV" (SCC: GTZ, n.d.b, pg.1). With GTZ initiative the

mission of SCC is to meet the goals of zero new HIV infections, zero HIV-related deaths, and zero HIV stigma/discrimination through a collaborative, countywide, multi-sector, multidimensional approach. (SCC: GTZ, n.d.b) The GTZ strategic plan responds to the needs identified in the California Needs Assessment for HIV, and aligns with both the local comprehensive plan, which is the Integrated HIV Surveillance, Prevention and Care Plan, and goals set forth by the NHAS (SCC: GTZ, n.d.b).

The goals of the program include; a) reduce new infection, b) reduce HIV related deaths, and c) reduce HIV-related stigma and health disparities in SCC (SCC: GTZ, n.d.b). To achieve these goals SCC has established four main strategies: i) improve PrEP and PEP access, ii) reduce stigma iii) improve guideline-based Sexually Transmittable Infection (STI) screening and HIV testing, and iv) increase linkage to care and retention in care (SCC: GTZ, n.d.c).

LITERATURE REVIEW

The vision of "Getting to Zero (GTZ)" was first adopted by The Joint United Nations Programme on HIV/AIDS (UNAIDS) in 2011 (Lawn, 2012; Haghdoost & Karamouzian, 2012). The aim was to define a shared, global, long-term strategy to fight the battle against the deadly HIV pandemic (Haghdoost & Karamouzian, 2012). In 2014, the goals were revised by UNAIDS and 90–90–90 targets were established. According to the new goals by 2020, 90% of all people living with HIV (PLWH) should know their HIV status, 90% of those diagnosed should receive sustained antiretroviral therapy (ART), of whom 90% should achieve sustained viral suppression. According to UNIAID, attaining the 90–90–90 targets is critical to achieve the ultimate goal of GTZ (Duncombe, Ravishankar, & Zuniga, 2019).

According to an article in the *Journal of American Medical Association* (JAMA) (2006), HIV prevention programs have been in place since 1982. The early programs were directed towards increasing awareness, providing basic information about the symptoms and transmission-routes and promoting methods to reduce the risks (JAMA, 2006). The programs were refined overtime, and by the year 2000 a three-pronged approach was adopted. The approach focused on i) prevention activities for people at high-risk, ii) HIV counselling, testing and referral services, and iii) efforts directed towards improving the health of people living with HIV and preventing further transmission (JAMA, 2006).

Prior to GTZ all previous prevention programs were focused towards reducing individual risk and providing treatment (JAMA, 2006). Few efforts were made to address other factors, like social and cultural components, political limitations, legal restraints, and other contextual factors that increase vulnerability to HIV (Edwards & Collins, 2014). According to Bekker, Beyrer, & Quinn, (2012), it was a challenge for experts to develop a program that was "feasible, effective,

affordable, community and population specific, and at the same time acceptable by all" (pg. 2). They believed that the ideal efforts will need a customized approach for specific behaviors, regions, and risk categories. The researchers support the UNAIDS approach of know your epidemic, know your response (Bekker, Beyer & Quinn, 2012). Bekker, Beyrer, & Quinn, (2012) highlights that with GTZ efforts UNAIDS have adopted a combination-approach to improve the prevention programs globally. The approach established by UNAIDS (2010) incorporates "individual relationship, community efforts, and societal factors to address the specific, but diverse needs of the populations and fight issues like stigma and discrimination faced by at-risk or people suffering from, HIV infection" (pg.5). With this new approach, GTZ strategy aims towards incorporating simultaneous use of i) biomedical approach, which will include HIV counselling, testing, treatment, ii) behavioral change that will motivate individuals through awareness programs in communities through educational, motivational, peer-led, and skill-building approaches; and iii) structural interventions that focus on the "physical, social, political, cultural, organizational, community, economic, legal, or policy aspects of the environment that facilitate or obstruct efforts to avoid HIV infection" (Bekker, Beyer & Quinn, 2012, pg.17).

In the past two decades, due to the progressive increase in the global access to antiretroviral therapy (ART), a huge decline was observed in HIV-related deaths and annual incidence of new infections (Ford, Victoria, Hirnschall, & Doherty, 2013). The incidence of new infection declined by 21% from the year 1997 to 2010, while there was a 22% decline in AIDS-related death during 2005-2010 (Garg & Singh, 2013).

New organizations, such as The Joint United Nations Programme on HIV/AIDS (UNAIDS) in 1996, the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) in 2002 and the US President's Emergency Plan for AIDS Relief (PEPFAR) in 2002, were formed to

improve HIV related efforts (Ortblad, Lozano, & Murray, 2013). These new global actors played a critical role to address issues related to funding disparities and access to care by bringing the nations worldwide together with an intent to end this pandemic in coming years (Ortblad, Lozano, & Murray, 2013). UNAIDS efforts accounted for an increase from $300 million in 1996 to $16 billion in 2009 in funding (Becker & Taykhman, 2011). By 2010, with these efforts in place, over six-million people from low- and middle-income countries were connected to adequate care (Becker & Taykhman, 2011). All these promising results gave hope that the course of this epidemic was now changing towards the right direction.

Becker & Taykhman (2011) stated that "Getting to Zero recognizes that the global response stands at a pivotal juncture and there is a need for the efforts to keep growing in the right direction" (pg.8). Through GTZ, UNAIDS laid the foundation of a global plan that established a blueprint for a future AIDS-free generation with "Zero new HIV infections, Zero-AIDS related deaths underpinned by Zero discrimination" (Buse, Blackshaw, & Ndayisaba, 2012, pg.1). Becker & Taykhman (2011) highlighted the three mutually reinforcing strategies that GTZ is focused on: "revolutionizing HIV prevention; catalyzing the next generation of treatment, care and support; and advancing human rights and gender equality" (pg.8). The plan requires the health community to innovate and adopt new strategies to intensify efforts and undertake a focused approach rather than implementing a generic response (Becker & Taykhman, 2011).

GTZ requires the health experts to take the AIDS response out of isolation and adopt a plan that is in integration with other health and social issues (Becker & Taykhman, 2011). Researchers believed that a context-sensitive approach like GTZ is critical at this point in time when promising medication, stable funding streams and political will are already in place to end this battle against HIV (Buse, Blackshaw, & Ndayisaba, 2012). Another body of literature believes

that there was a need for a global plan like GTZ, as there was a lot left to achieve. For every one person who got access to care, two new infections were identified and there were over 10 million who needed treatment, but still lack access (Becker & Taykhman, 2011). According to Michel Sidibé, Executive Director of UNAIDS, around this juncture there was a "desperate need to achieve an AIDS transition that sees more people getting treatment than are newly infected" (Becker & Taykhman, 2011, pg.8).

Many researchers and domain experts have analyzed the vision of GTZ through multiple lenses (El-Sadr, Harripersaud, & Bayer, 2014; Lawn, 2012; Haghdoost & Karamouzian, 2012; Ford, Victoria, Himshall & Dougherty, 2013; Garg & Singh, 2013; Jenkins, 2018). Most of them embrace the approach, however find it ambitious and overarching to an extent. On the other hand, there are articles that highlight the challenges associated with the new approach and suggest the way forward (Haghdoost & Karamouzian, 2012; Garg & Singh, 2013; Jenkins, 2018). A few other scholars believe that the vision of GTZ is flawed and lacks a holistic approach (Chitembo, et.al, 2012).

The primary motivation that brings optimism for GTZ is guided by the promising medical advancements that have occurred in past decades and the anticipated developments that are on their way (El-Sadr, Harripersaud, & Bayer, 2014). Many countries with high prevalence of the disease were able to scale up their program with effective medication in place. These efforts are showing a decline in HIV related death, a decline in new cases among children and increased prevention against mother-to-child transmission (El-Sadr, Harripersaud, & Bayer, 2014).

Increasing efficacy of the ART is one of the foremost reasons for confidence among the experts (Ford, Victoria, Hirnschall, & Doherty, 2013). The goals of ART have been expanding as well, as initially the focus was towards preventing AIDS-related deaths (Lawn, 2012). Now ART

has been identified to play a promising role in tackling this epidemic through prevention (Lawn, 2012).

WHO issued its first recommendations on use of pre-exposure oral prophylaxis (PrEP) in 2012. Clinical trials established that people who can maintain an undetectable viral load have very low risk of disease transmission (Lawn, 2012). WHO guidelines around early initiation of therapy were revised, and based on the latest guidelines it is recommended to start the treatment as soon as the person gets diagnosed (Plazy, Dabis, Naidu, Orne-Gliemann, Barnighausen, 2015).

The strategy of GTZ aims towards identifying more individuals suffering with the disease, initiating early and immediate treatment for those diagnosed and at-risk, with an effort to suppress their viral loads (Lawn, 2012). Lawn (2012) suggests that these efforts can lead to a suppressed overall "community viral load" which would be anticipated to cease the transmission and thereby help curb the epidemic. To many this key strategy in place sounds promising (Lawn, 2012).

Lawn (2012) puts forward the formation of the Global HIV Vaccine Enterprise in 2003 as another reason for optimism. It is an alliance of organizations committed towards development of a preventive HIV vaccine (Voronin, Manrique & Bernstein, 2010). A recent clinical trial in Thailand provided evidence of efficacy for an HIV vaccine. This result has restored confidence of the domain scientists and experts (Lawn, 2012 and Voronin, Manrique & Bernstein, 2010).

In July 2012, the International AIDS Society published a document titled Towards a cure. This document describes a global strategy for finding a cure for HIV infection (Lawn, 2012). The document states, "The first ever possible cure of a patient living with HIV has been reported after receiving a stem cell transplant from a donor who was homozygous for CCR5 delta32 as treatment for acute myeloid leukemia" (Lawn, 2012, pg. 896). Huge scientific progress in the last decade has given the experts the confidence that the vision of GTZ, though ambitious, is achievable. The

experts believe that the health community has both prevention and treatment tools to accomplish the far-reaching gains (Lawn, 2012 and Buse, Blackshaw, & Ndayisaba, 2012).

On the other hand, despite all the medical progress, scientists have many questions for different aspects of the global plan. GTZ plan is widely accepted among experts, however they assert that many related challenges are neglected in the current approach. Haghdoost & Karamouzian (2012) states that "HIV/AIDS is not merely an infection, it is a complex issue" (pg. 819). Whether GTZ will prove to be yet another aspirational campaign, or a realistic strategy, depends on the deep understanding of the complexities related to the disease (Haghdoost & Karamouzian, 2012).

The perception is that the plan lacks a holistic view of health as a right for all, and is narrowly focused on HIV prevention (Chitembo, et. al, 2012). The researchers with a focus on maternal and child care raise concern that the plan has strategies in place which might interfere with the human rights of women living with HIV (Chitembo, et. al, 2012). Chitembo and others fret the mandatory HIV testing as an effort to identify HIV among expecting women and prevent vertical transmission to offspring. They believe that these approaches are unethical and contrary to public health and human rights goals. They are concerned that such efforts might make women avoid antenatal care services because of the fear of being forced to have an HIV test (Chitembo, et. al, 2012). They criticize GTZ, arguing that the approach is more focused towards preventing vertical transmission from mother to babies, to avoid the religious and political lash back associated with promoting contraceptive use, condoms, and abortion (Chitembo, et. al, 2012).

There are other researchers who do not oppose testing, but still find GTZ strategies challenging (Garg and Singh, 2013). They believe that even if HIV testing becomes compulsory, and all mothers delivering in health centers are screened for HIV, there will be a substantial number

of women who choose to deliver at home, and those will still be left undiagnosed (Garg and Singh, 2013).

The GTZ approach does not effectively address the issues related to LGBTQIA+ community (Lesbian, Gay, Bisexual, Transgender/transsexual, Queer/Questioning, Intersex, Asexuality, and others) (Krishan, Dehal, Singh, Kanchan & Rishi, 2018). Researchers assert that the western part of the world is advancing towards recognizing same-sex marriages and equality of civil rights (Krishan, et. al., 2018). However, on the Eastern part of the globe, many countries still do not accept these norms. Laws have been enacted for criminalizing acts related to these lifestyles, which may have a serious impact on public health (Krishan, et. al. 2018). Becker & Taykhman (2011) points out that there are about 120 countries where there are legal constraints that make it difficult for some core populations—like men who have sex with men, sex workers, and people who use drugs—to access care, thus increasing their likelihood of infection.

By and large these societies associate HIV/AIDS diagnosis with immoral and risky behaviors (Valdiserri, 2002). A number of studies claim that people living with HIV experience an extensive discrimination in health care settings, as well (Valdiserri, 2002 and Haghdoost & Karamouzian, 2012). Stigma and discrimination associated with the disease impose a huge limitation for the success and effectiveness of any prevention programs (Haghdoost & Karamouzian, 2012). Achieving "Zero Discrimination" is a critical yet most challenging goal of GTZ, as it will require a societal change in thinking, globally (Becker & Taykhman, 2011).

Jenkins (2018) sets forth yet another big challenge. He states that GTZ cannot achieve its goals without paying attention to substance use. Injectable drug-users are a core population at-risk of HIV related infections and death. They are easily missed when strategies are designed (Jenkins, 2018). Providing clean-syringes does not solve their issues because drug use is not the only issue

that predisposes them to this disease (Haghdoost & Karamouzian, 2012). Haghdoost & Karamouzian (2012) explains that often drug-users consist of the marginalized, homeless population lacking access to adequate services, who may also be suffering from some psychological or mental issues. Jenkins (2018) suggested that for successful GTZ efforts there is a need for a comprehensive approach of "Seek, Test, Treat and Retain" (pg.229) towards this disadvantaged population.

Some researchers also expressed concern about the challenges faced when HIV gets superimposed with other infections, like tuberculosis and other dreaded diseases. It makes the condition worse and pandemic deadly (Haghdoost & Karamouzian, 2012). GTZ efforts need focused strategies for such extreme conditions.

Last but not least, as the program will succeed in identifying people with HIV and connecting them to care, it will result in a greater number of people living with HIV (Ford, Victoria, Himshall and Dougherty, 2013). With this change in longevity, chronic HIV-related conditions like AIDS-related and non-AIDS related cancers, hepatitis, neurological and cardiovascular disorders will rise as well. The researchers advise the public health departments to be ready with affordable approaches to manage the chronic HIV-related conditions (Ford et al., 2013).

Getting to Zero 2030

The United States government is determined to overcome the HIV virus and control the epidemic in the next 10 years (Fauci, Redfield, Sigounas, Weahkee, & Giroir, 2019). It is invested towards the continued efforts that will be required to achieve the aspirational goals of GTZ. Prevention is the cornerstone of the national strategy (Fauci et.al, 2019). The strategy includes continued efforts to develop long-acting PrEP medication to improve adherence, to reduce the cost of treatment and

improve access to care (Fauci et.al, 2019). Beyond prevention, an effective national strategy will ensure that those living with HIV maintain long-term viral suppression. The US Food and Drug Administration plans to consider and test the efficacy and safety of PrEP over-the-counter dispensing (Fauci et.al, 2019). Another area of focus is the racial, socioeconomic, and geographic health disparities associated with HIV. One of the vital goals is to identify the key hotspots of HIV infection. This information will be used to develop strategies for specific focus to disrupt the kinetics of HIV spread (Fauci et.al, 2019). The major stakeholders of the initiative are city, county, and state public health departments, local and regional clinics and health care facilities, clinicians, providers of medication-assisted treatment for opioid use disorder, and community- and faith-based organizations (Fauci et.al, 2019). The success of the initiative is dependent on the active partnerships among the stakeholders (Fauci et.al, 2019).

On the eastern part of the globe, countries like India are also on the path to develop a roadmap to zero new HIV infections, zero discrimination & zero AIDS-related deaths (Palchaudhuri, Niggl & Palmer, 2016). At the end of 2013, it was estimated that India constituted the third largest number of people living with HIV. The current program aims at reducing annual new HIV cases by 50 per cent. The administration acknowledges that this goal is well short of the global goal due to multiple factors. (Palchaudhuri, Niggl & Palmer, 2016). Implementing a common national health strategy becomes challenging in an extremely socially and culturally diverse country like India. PrEP is a new concept for the country. There are no national PrEP guidelines that exist currently (Palchaudhuri, Niggl & Palmer, 2016). On the other hand, Indian generic pharmaceuticals manufacturers lead in the production of quality-assured HIV medication (ART) at a lower cost. Such developments can contribute towards formulating effective strategies to provide HIV treatment at lower cost. Laws about homosexuality have been revised by the

Supreme Court of India in 2017-18. India has made significant progress in the past and the current administration is determined to improve ongoing efforts and achieve intended 2030 goals (Palchaudhuri, Niggl & Palmer, 2016).

Australia is one of the few countries that is making impressive progress towards the GTZ goals (Palchaudhuri, Niggl & Palmer, 2016). Through effective health policy in place, the country is very close to containing the epidemic in Australia. Australian strategy includes (i) targeted HIV prevention programs, (ii) engagement with HIV-positive people in all phases of the program design, from initiation of the concept, development of strategies to implementation process, (iii) targeted focus on high-risk behaviors rather than high-risk population, and iv) exceptional focus to reduce disease related stigma and discrimination through community education and management of HIV and AIDS as a public health issue (Palchaudhuri, Niggl & Palmer, 2016).

Another promising effort towards achieving goals by 2030 is the launch of Fast-Track Cities initiative at the Paris Declaration in 2014 (Duncombe, Ravishankar, & Zuniga, 2019). The aim is to accelerate HIV responses in low-income and middle-income countries. The underlying theory is that cities can take local actions for global impact (Duncombe, Ravishankar, & Zuniga, 2019). According to UNAIDS 2016 report, more than half of the world's population lives in cities. Data shows that cities account for a significant ever-growing proportion of people living with HIV and other diseases. In the past, cities have taken the lead in the AIDS response, as well. On that account, UNAIDS identified cities as critical for focused efforts. Since its launch more than 300 cities have signed the declaration so far (Duncombe, Ravishankar, & Zuniga, 2019).

It is understood that this disease is difficult to eradicate due to complexity arising from multiple factors in play. However, at present researchers believe momentum is on the side of success, and together nations can work towards the vision of GTZ, even if it is not entirely

reachable (Haghdoost & Karamouzian, 2012). GTZ establishes a promising approach that calls for a firm and effective collaboration from all stakeholders, from all domains- public, private or non-profit, and from governments around the globe (Haghdoost & Karamouzian, 2012). With collective efforts and continued commitments there is a hope to advance towards a world free from the HIV/AIDS epidemic (El-Sadr, Harripersaud, Bayer, 2014).

METHODOLOGY

The methodology used to evaluate this research applied Bardach and Patashnik's (2016) Benchmark Analysis model. This model was adopted to determine how does Santa Clara County's outcome for its Getting to Zero (GTZ) program differs in comparison to other selected California counties. GTZ was adopted by the SCC in 2016. The goals of the program are: a) reduce new infection, b) reduce HIV related deaths, and c) reduce HIV-related stigma and health disparities in SCC. To achieve these goals, SCC established four main strategies: i) improve PrEP and PEP access, ii) reduce stigma iii) improve guideline-based Sexually Transmittable Infection (STI) screening and HIV testing, and iv) increase linkage to care, and retention in care.

The research used the Continuum of Care data to reflect whether the established strategies enabled the county to achieve different outcomes. Continuum of Care includes three measures: i) total number of people living with HIV, ii) number of people linked to care, and iii) number of people retained in care. Change (increase/decrease) in the number of people living with diagnosed HIV reflected upon the efforts towards stigma reduction, improved STI screening and testing and awareness efforts. Change in the number of people linked to care reflected that a system was established where people can get access to care, either through improvement in PrEP/ PEP services or linkage to care. Number of people retained in care reflected that the support system was in place, and strategies existed that enabled people to overcome HIV related stigma and discrimination, and continue to take treatment (retention).

Three other data measures considered were i) number of people newly diagnosed each year, ii) people living with diagnosed HIV infection, and iii) number of deaths each year. These three measures also reflected upon the established strategies. Increase in yearly new diagnosis reflected upon successful efforts towards stigma reduction and improved STI screening and testing. In

contrast, a decrease in yearly new diagnosis was indicative of improved PrEP and PEP access, as well as increased linkage to care and retention in care. Change in the number of people living with diagnosed HIV infection reflected improved access to care (linkage and retention) and more people being aware of their positive HIV status. Change (decrease) in the number of HIV/AIDS related deaths reflected on the overall success of all the strategies in place.

Research for this project focused on comparing the data of ten counties, including SCC. The primary factor for selecting counties was their proximity and comparable population size with respect to SCC. Two counties comparable in population size are selected from the Southern California region to observe any difference in result. The ten counties included in the analysis are SCC, San Diego, Orange, Alameda, Contra Costa, Sacramento, Solano, San Francisco, San Mateo, and Sonoma counties. All these counties were participating in GTZ efforts, either independently through their individual GTZ plan, or in collaboration with the California State Office of AIDS GTZ plan, or both.

Another focus of this paper was to analyze the SCC funding process, to determine how SCC's spending for GTZ differs from other selected counties. In the majority of cases all the HIV prevention efforts (GTZ efforts) are funded by the Centers for Disease Control and Prevention (CDC) through a state funding for each county in California, or directly through CDC. In SCC, GTZ efforts were also supported by funding approved by the Board of Supervisors of the county for the period of 2016 to 2020. Per capita spending was calculated based on the total number of people living with HIV in each county, and the total population of each county. The findings of this research were used to identify any correlation between the amount of funding (per capita) and outcomes identified through analyzing Continuum of Care data.

Data selected for the research came from 2016, 2017, and 2018 epidemiology reports of each county, accessed through the publicly available open data portal on each county's website or through California Department of Public Health: Office of AIDS HIV statistics report. As GTZ efforts were adopted in 2016, and currently the last report available was from 2018, that determined the range across which data was analyzed.

For per capita funding analysis, data on the amount each county received through the state was selected from the county-wide funding report from California Department of Public Health: Office of AIDS. For the counties which were directly funded by CDC, the data was selected from the CDC funding report. Data on the number of people living with HIV came from the epidemiology report of each county. California census data was used to determine the population of each county.

The research highlighted counties that are achieving different outcomes after adopting the GTZ approach. Also, benchmarking laid down a comparative picture to show that some counties are able to achieve better outcomes than others. For the purpose of this research project, a better outcome was measured in terms of the percentage change of the desired results for the aforementioned data measures from 2016-18. This report opens an opportunity for all the counties to learn from each other's GTZ plan, and adopt strategies or identify best practices which are enabling different results. In addition, this research can provide some guidance to those counties that are in the process of adopting their own GTZ plan.

Findings from the per capita funding analysis opens a prospect for the counties to look into opportunities to improve funding for GTZ efforts in order to improve results. For SCC specifically, the findings were indicative of whether county funding should be continued for the next cycle, or how the money might be better applied to achieve the goals of GTZ.

FINDINGS

People Living with Diagnosed HIV Infection (PLWDH)

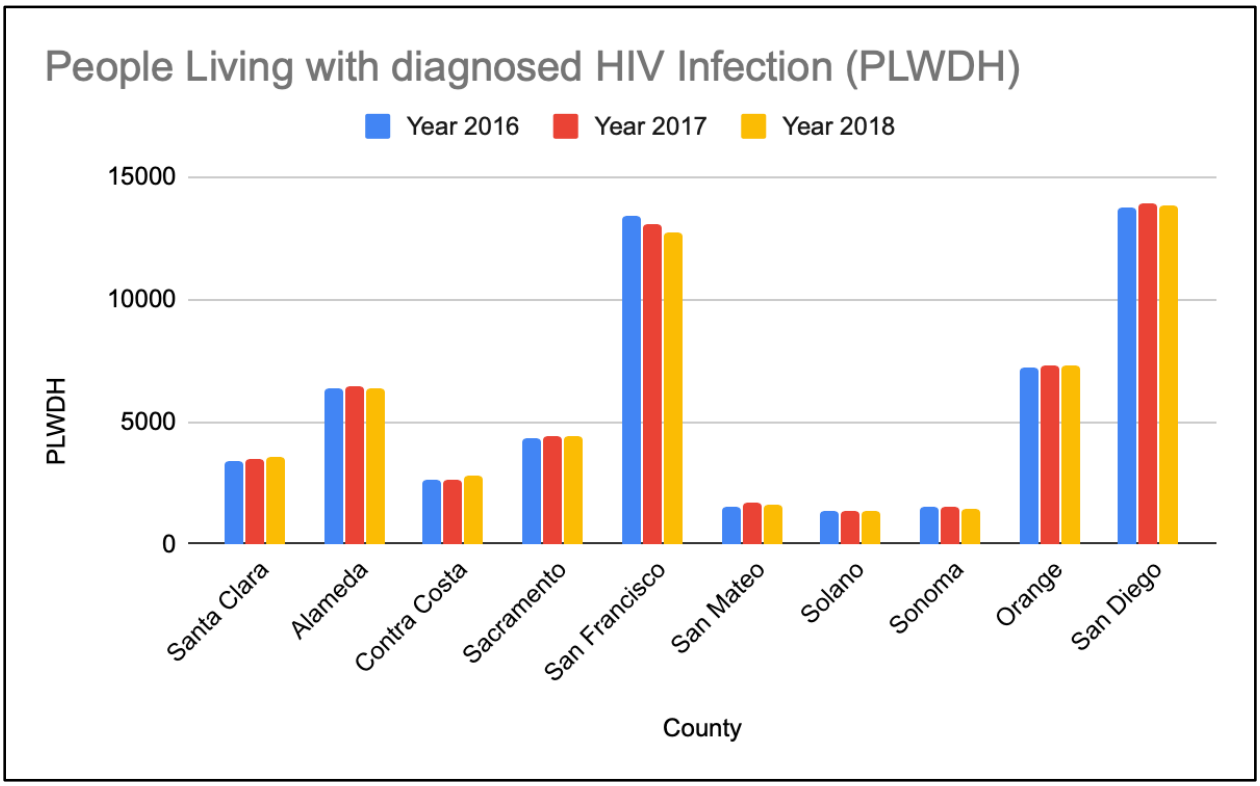
Table 1 demonstrates the number of People Living with Diagnosed HIV (PLWDH) in the ten counties of California and the rate of change in the number of PLWDH from 2016 to 2017 and from 2017 to 2018. Net change column reflects the overall change from 2016-18. The table shows the data for the years 2016, 2017 and 2018, after the launch of the Getting to Zero initiative in California. The data has been drawn from the respective county's HIV statistics report, and California Department of Public Health: Office of AIDS (CDPH: OA) HIV surveillance reports. For the purpose of this study, eight counties from the northern California region are selected. Two counties, Orange and San Diego, are selected from the southern California region. Santa Clara County is selected as a benchmark county. Figure 1 is the graphical representation of data in Table 1 showing trends of PLWDH for each county.

Table 1: People Living with Diagnosed HIV Infection (PLWDH)

County	2016	2017	2018	% Change		
				2016-17	2017 - 18	Net Change
Northern California						
Santa Clara	3370	3502	3551	**+3.92**	**+1.40**	**5.37**
Alameda	6333	6419	6375	**+1.36**	**-0.69**	**0.66**
Contra Costa	2590	2648	2772	**+2.24**	**+4.68**	**7.03**
Sacramento	4344	4405	4451	**+1.40**	**+1.04**	**2.46**
San Francisco	13,400	13,072	12,725	**-2.45**	**-2.65**	**-5.04**
San Mateo	1530	1656	1652	**+8.24**	**-0.24**	**7.97**
Solano	1327	1317	1329	**-0.75**	**+0.91**	**0.15**
Sonoma	1523	1490	1481	**-2.17**	**-0.60**	**-2.76**
Southern California						
Orange	7245	7294	7300	**+0.68**	**+0.08**	**0.76**
San Diego	13,725	13,900	13,866	**+1.28**	**-0.24**	**1.03**

Source: HIV Statistics report from respective county for the year 2016, 2017 and 2018; CDPH: OA, 2018; CDPH: OA, 2020.

Figure 1: People Living with Diagnosed HIV Infection (PLWDH)



Key findings of Table 1 and Figure 1

Table 1 shows that the total number of people living with diagnosed HIV (PLWDH) have increased overall, depicted by the net change, in all the counties since the launch of GTZ, except in San Francisco and Sonoma.

On a closer inspection it was observed that in 2017 three counties, San Francisco (-2.45%), Sonoma (-2.17%), and Solano (-0.75%), experienced a decrease in the PLWDH (depicted in Table 1 through negative percentage change observed in 2016-17). The rest exhibited an increase in the PLWDH (depicted in Table 1 through a positive percentage change observed during 2016-17 varying from 0.68% to 8.24%). In the third year of GTZ adoption (2018), half of the counties (five out ten) showed a decrease in PLWDH (depicted in Table 1 by a negative percentage change observed in 2017-18 varying from -0.24% to -2.65%) compared to 2017, while the rest continued

to show an increase in PLWDH (depicted in Table 1 through positive percentage change observed in 2017-18 varying from 0.08 to 4.68%).

Sonoma and San Francisco are the two counties which demonstrated a continuous decline in PLWDH in both the years. San Francisco showed a consistent decline of -2.45% and -2.65% in 2017 and 2018 respectively. On the other hand, Sonoma county showed a decline of -2.17 % in 2017 and -0.60% in 2018. In Santa Clara, Sacramento, Contra Costa and Orange County, a continued increase in PLWDH was observed in both the years.

Overall, looking at the net change, it can be observed that the number of PLWDH increased in eight out of ten counties analyzed from 2016-18. However, an overall decline was observed in San Francisco and Sonoma.

New Cases of HIV

Table 2 demonstrates the number of new cases that were diagnosed in the ten counties of California and the rate of change in the number of new cases from 2016 to 2017 and from 2017 to 2018 (in %). Net change (in %) column reflects the overall change from 2016-18. The table shows the data for the years 2016, 2017 and 2018, after the launch of the Getting to Zero initiative in California. The data has been drawn from the county's HIV statistics report, and California Department of Public Health: Office of AIDS (CDPH: OA) HIV surveillance reports. For the purpose of this study, eight counties from the Northern California region are selected, with Santa Clara selected as a benchmark county. Two counties, Orange and San Diego, are selected from the Southern California region. Figure 2 is the graphical representation of data in Table 2 showing trends of number of new cases that were identified in each county.

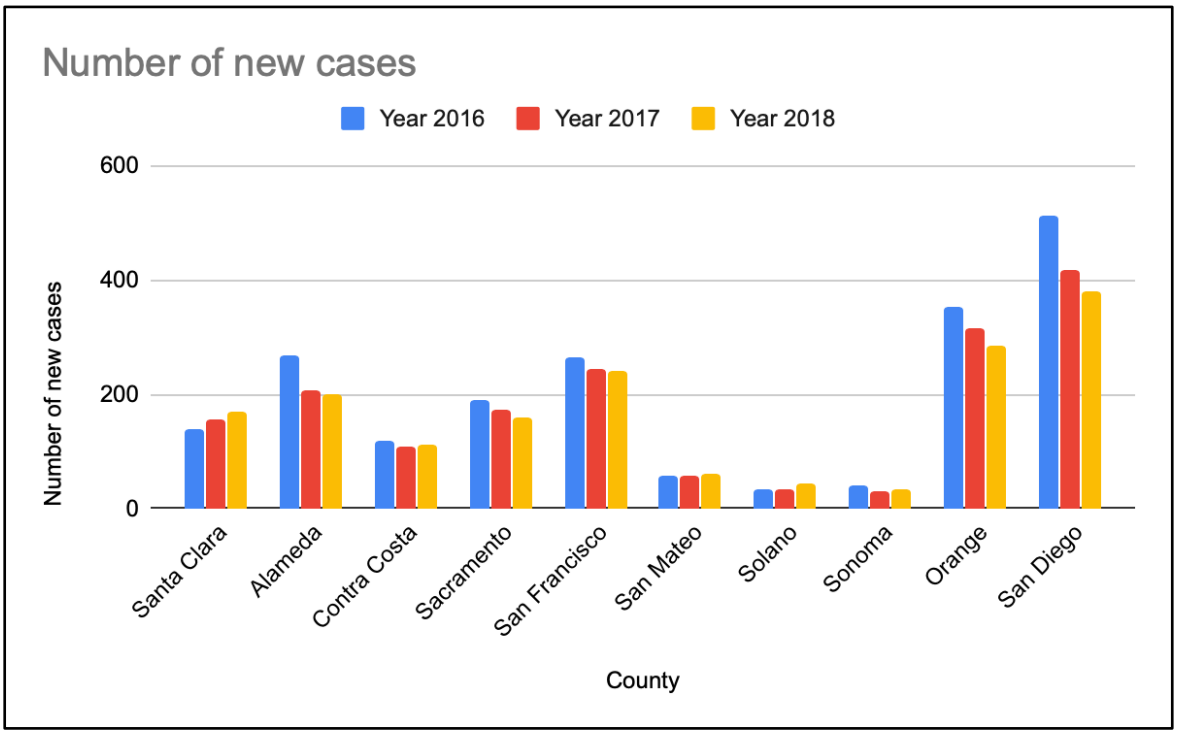
Table 2: New Cases of HIV and Rate of Change in the Number of New Cases of HIV

County	2016	2017	2018	% change		
				2016-2017	2017-2018	Net Change
Northern California						
Santa Clara	139	156	168	**+12.23**	**+7.69**	**20.86**
Alameda	268	206	200	**-23.13**	**-2.91**	**-25.37**
Contra Costa	119	109	112	**-8.40**	**+2.75**	**-5.88**
Sacramento	191	173	159	**-9.42**	**-8.09**	**-16.75**
San Francisco	266	244	240	**-8.27**	**-1.64**	**-9.77**
San Mateo	59	58	61	**-1.69**	**+5.17**	**3.39**
Solano	33	35	45	**+6.06**	**+28.57**	**36.36**
Sonoma	40	30	33	**-25.00**	**+10.00**	**-17.50**
Southern California						
Orange	352	315	286	**-10.51**	**-9.21**	**-18.75**
San Diego	514	418	379	**-18.68**	**-9.33**	**-26.26**

Source: HIV Statistics Report from respective counties for the year 2016, 2017 and 2018;

CDPH: OA, 2018; CDPH: OA, 2020.

Figure 2 New Cases of HIV in Each County (2016, 2017, 2018)



Key findings of Table 2 and Figure 2

According to Table 2, it can be observed that two counties, Santa Clara and Solano, exhibit an increase in the number of new HIV cases in both 2017 and 2018. However, Alameda, Sacramento, San Francisco, Orange, and San Diego all showed a consistent decline in the number of new cases that were identified in both 2017 and 2018. San Mateo, Sonoma and Contra Costa, on the other hand, do not exhibit a consistent pattern.

In Sonoma and Contra Costa, a significant decline was observed after the launch of GTZ in 2016-17 however, the number increased slightly during 2017-18. In San Mateo, the number of new cases declined by a small percentage (-1.69%) in 2016-17 followed by an increase (+5.17%) in 2017-18. It was observed that in 2017, eight out of ten counties showed a negative rate of increase in the number of new HIV cases. This means that the number of new cases declined in eight out of ten counties after the launch of the GTZ program. The percentage change varied from

-1.69% to -25%. In the third year of GTZ adoption (2018), five out of those eight counties continued to show a negative rate of increase in the number of new HIV cases, with the rate varying from -1.64 to -9.33%. This means five out of ten counties analyzed presented a decline in both years.

Overall, looking at the net change from 2016-18 it can be observed that the desired result, which is to have a decrease in the number of new cases, was observed in seven out of ten counties analyzed. Santa Clara and Solano were the two counties that presented a significantly high positive rate change in both 2016-17 and 2017-18, contributing to a positive net change (increase in number of new cases). San Mateo, as a result of comparatively higher increase in 2017-18, also showed an overall positive net increase in the number of new cases from 2016-2018. Figure 2 demonstrates a graphical presentation of the trends observed in the number of new cases across 2016, 2017, 2018 for each county.

Number of Deaths due to HIV

Table 3 demonstrates the number of people who died as a result of HIV/AIDS -related illnesses in the ten counties of California, and the rate of change in the number of deaths that occurred, from 2016 to 2017 and from 2017 to 2018. Net change (in %) column reflects the overall change from 2016-18. The table shows the data for the years 2016, 2017 and 2018, after the launch of the Getting to Zero initiative in California. The data has been drawn from the respective county's HIV statistics report, and California Department of Public Health: Office of AIDS (CDPH: OA) HIV surveillance reports. For the purpose of this study eight counties from the Northern California region are selected, with Santa Clara selected as a benchmark county. Two counties, Orange and San Diego, are selected from the Southern California region. Figure 3 is the graphical presentation of data in Table 3 showing the trends of number of deaths occurring in each county.

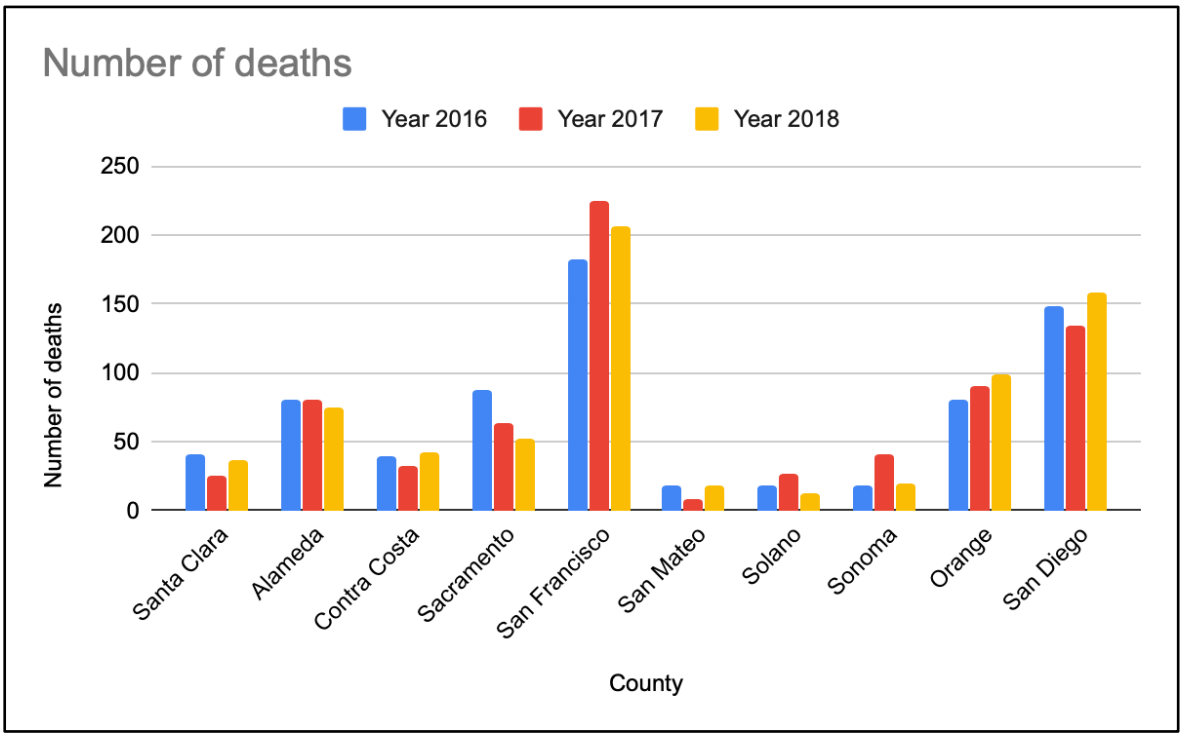
Table 3: Number of Deaths and Rate of Change in the Number of Deaths

County	2016	2017	2018	2016-2017	2017-2018	Net Change
Northern California						
Santa Clara	41	25	37	**-39.02**	**+48.00**	**-9.76**
Alameda	80	81	75	**+1.25**	**-7.41**	**-6.25**
Contra Costa	39	33	42	**-15.38**	**+27.27**	**7.69**
Sacramento	87	63	52	**-27.59**	**-17.46**	**-40.23**
San Francisco	182	225	207	**23.63**	**-8.00**	**13.74**
San Mateo	18	8	19	**-55.56**	**+137.50**	**5.56**
Solano	19	27	13	**+42.11**	**-51.85**	**-31.58**
Sonoma	18	41	20	**+127.78**	**-51.22**	**11.11**
Southern California						
Orange	81	91	99	**+12.35**	**+8.79**	**22.22**
San Diego	149	134	159	**-10.07**	**+18.66**	**6.71**

Source: HIV Statistics Report from respective counties for the year 2016, 2017 and 2018;

CDPH: OA, 2018; CDPH: OA, 2020.

Figure 3 Number of Deaths in Each County (2016, 2017, 2018)



Key findings of Table 3 and Figure 3

Table 3 and Figure 3 depict the total number of deaths that occurred as a result of HIV/AIDS related diseases. The data demonstrates fluctuating results in all the counties, since the launch of GTZ in 2016, except in Sacramento and Orange County.

In 2017, five counties- San Diego (-10.07%), San Mateo (-55.56%), Sacramento (-27.59%), Contra Costa (-15.38%) and Santa Clara (-39.02%) - showed a decline in the number of deaths due to HIV/AIDS related diseases (depicted in Table 3 through a negative percentage change observed in 2016-2017). The rest (five) exhibited an increase in the number of death cases (depicted in Table 3 through a positive percentage change observed in 2016-2017 varying from 1.25% to 127.78%). In the third year of GTZ adoption (2018), again five counties demonstrated a decrease in the number of deaths (depicted in Table 3 through a negative percentage change observed in 2017-18 varying from 7.41% to 51.85%), while the rest continued to show an increase

in death cases (depicted in Table 3 through a positive percentage change observed in 2017-2018 varying from 8.79 to 137.5%).

Sacramento and Orange were the only two counties which presented consistent trends in both the years. Sacramento is the only county that demonstrated downward trends (decline in number deaths), with decline of -27.59% observed during 2016-17 and decline of -17.46% during 2017-2018. Orange county, on the other hand, depicted an increase in the number of deaths in both the years. An increase of 12.35% was observed during 2016-17 and an increase of 8.79% was observed during 2017-18.

Overall, the data for the number of deaths occurring in the counties each year does not paint any consistent picture to draw any conclusions about the program. Figure 3 demonstrates a graphical presentation of the trends observed in the number of deaths that occurred across 2016, 2017, 2018 for each county.

Continuum of Care (2016, 2017, 2018)

Table 4 demonstrates the Continuum of Care data for the year 2016, 2017 and 2018 for the selected ten counties of California. The table shows three data points for each year i) total number of people living with HIV in each county, ii) total number of people connected to care, with minimum 1 HIV test positive, in each county, and iii) total number of people that were retained in care and were reported to be virally suppressed in each county. Retention in care data reports the number of people whose HIV viral load test during that given year was ≤ 200 copies/ml.

The table shows the data for the years 2016, 2017 and 2018, after the launch of the Getting to Zero initiative in California. The data has been drawn from the respective county's HIV statistics report, and California Department of Public Health: Office of AIDS (CDPH: OA) HIV surveillance reports. For the purpose of this study, eight counties from the Northern California region are selected, with Santa Clara selected as a benchmark county. Two counties, Orange and San Diego, are selected from the Southern California region.

Figure 4 (2016), Figure 4.1(2017) and Figure 4.2 (2018) are the graphical presentation of Continuum of Care data for each year listed in Table 4. The figures show trends within each county, and also demonstrate a pattern that occurs at each step of the continuum.

Table 4 Continuum of Care (2016, 2017, 2018)

County	2016			2017			2018		
	Total Living	Connected	Retained	Total Living	Connected	Retained	Total Living	Connected	Retained
Northern California									
Santa Clara	3370	2428	2044	3502	2724	2315	3551	2804	2473
Alameda	6333	5011	4377	6419	5151	4496	6375	5113	4540
Contra Costa	2590	2129	1886	2648	2188	1942	2772	2319	2072
Sacramento	4344	3510	2977	4405	3488	3031	4451	3520	3111
San Francisco	13400	10934	9,872	13072	10554	9,602	12725	10284	9440
San Mateo	1530	1123	873	1656	1267	1041	1652	1281	986
Solano	1327	1012	903	1317	963	869	1329	1018	922
Sonoma	1523	1279	1175	1490	1259	1180	1481	1287	1210
Southern California									
Orange	7245	4830	4214	7294	4944	4225	7300	4978	4163
San Diego	13725	9450	7,754	13900	10003	8125	13866	9919	8378

Source: HIV Statistics Report from respective counties for the year 2016, 2017 and 2018; CDPH: OA, 2018; CDPH: OA, 2020.

Figure 4 Continuum of Care 2016

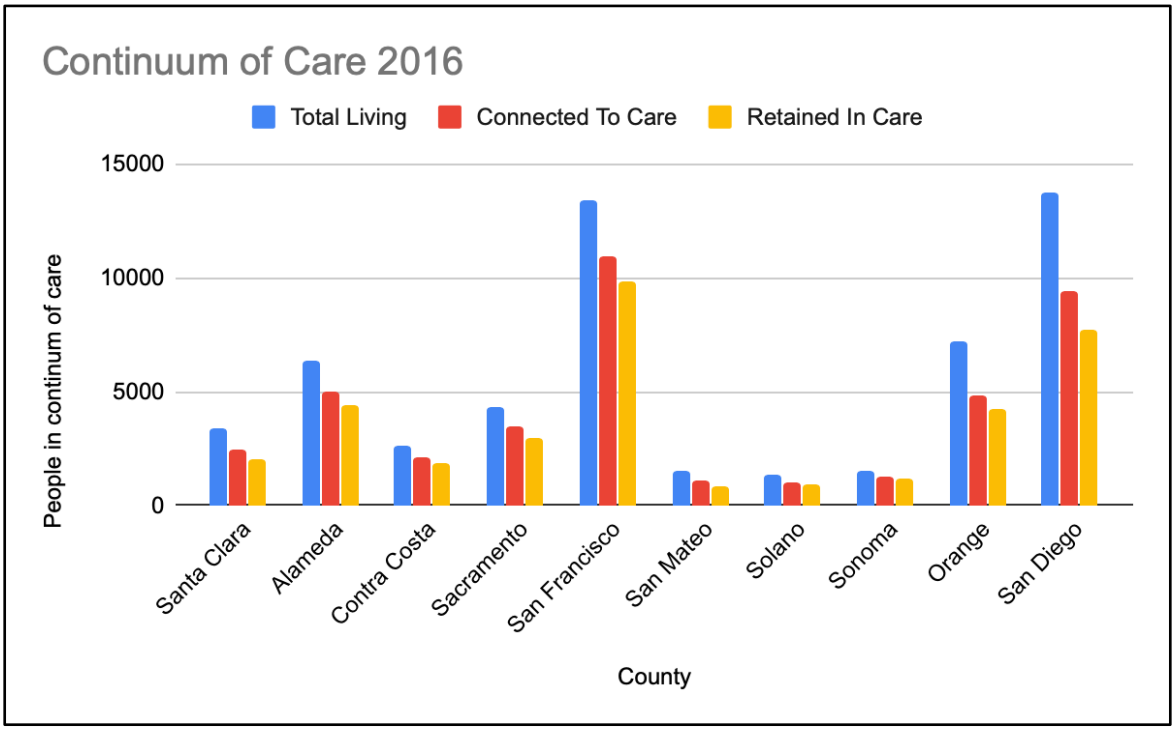


Figure 4.1 Continuum of Care 2017

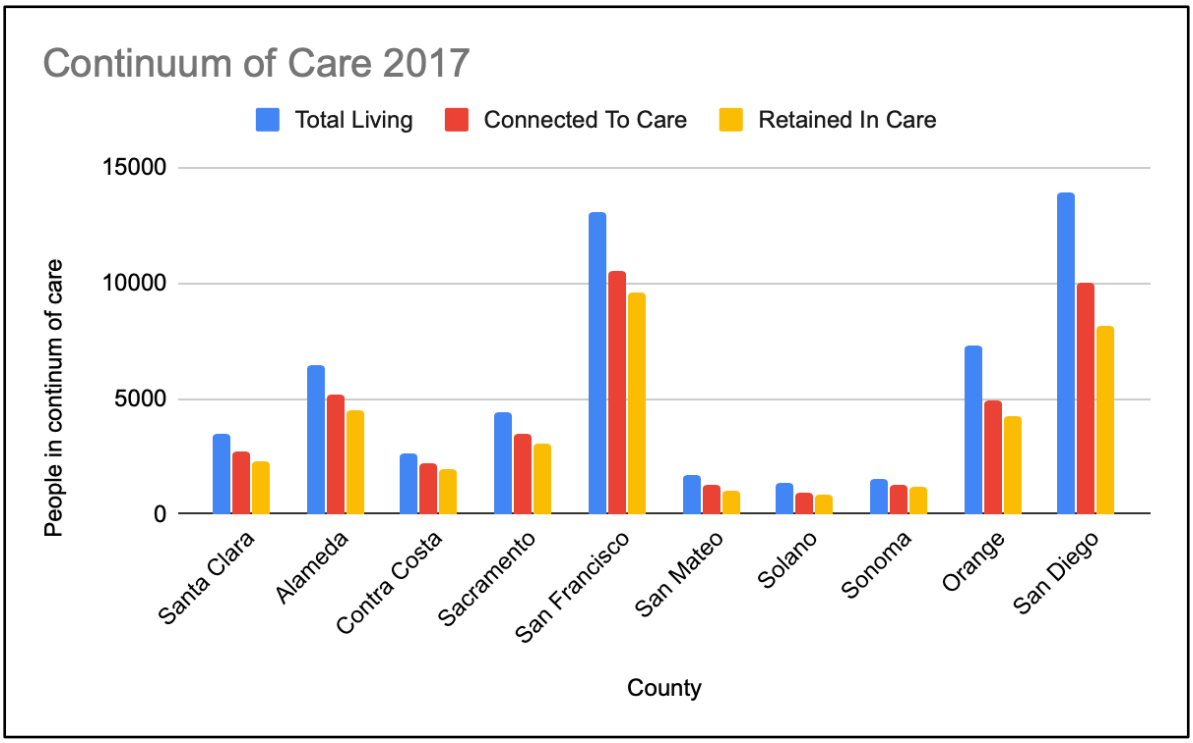
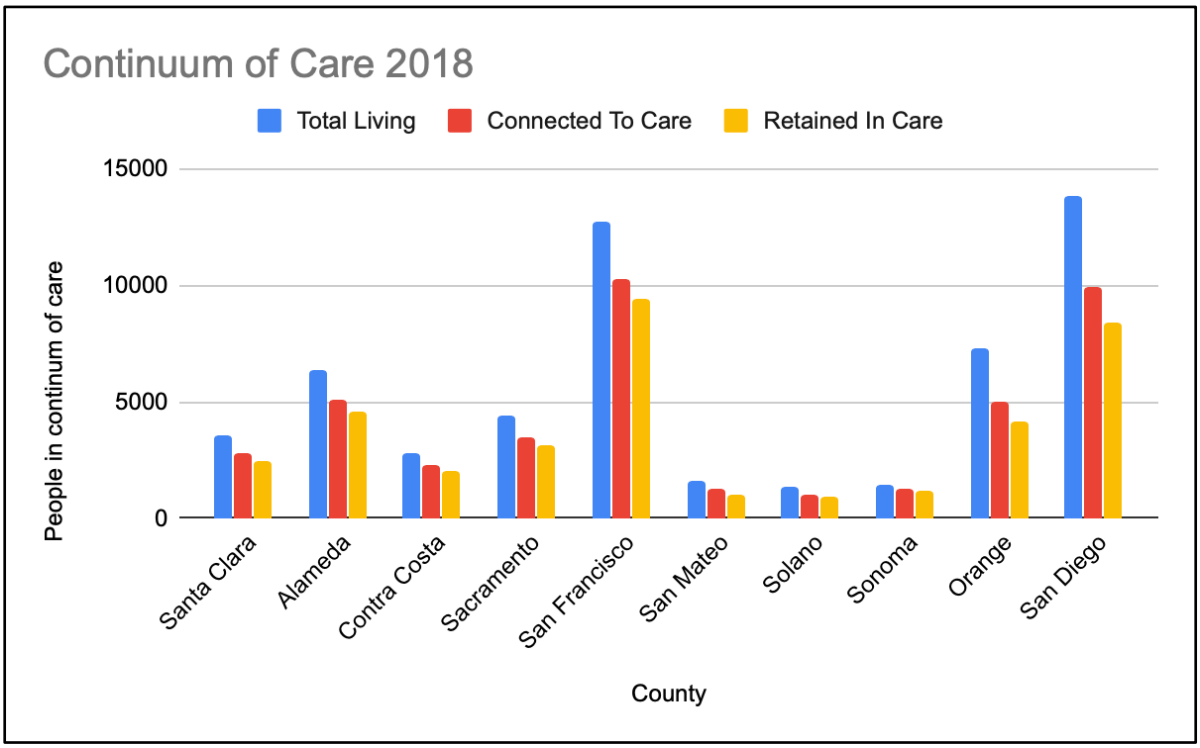


Figure 4.2: Continuum of Care 2018



Key findings of Table 4 and Figure 4, 4.1 and 4.2

Table 4 shows the Continuum of Care data for the years 2016, 2017 and 2018. Figure 4 is a graphical presentation of Continuum of Care for the year 2016. Figure 4.1 is the graphical presentation of Continuum of Care for the year 2017. Figure 4.2 is the graphical presentation of Continuum of Care for the year 2018.

Looking closely at the data it can be observed that there is a drop occurring at each step of the continuum in each county every year. The first drop can be observed in the number of people that are connected to care compared to the total number of people that were identified living with HIV. The second drop can be observed in the total number of people that were retained in care compared to the total connected to care. However, it can also be noted, by looking at each measure of the Continuum independently across the years (2016-2017-2018), that almost all counties are able to progressively reduce these gaps that occur at each step.

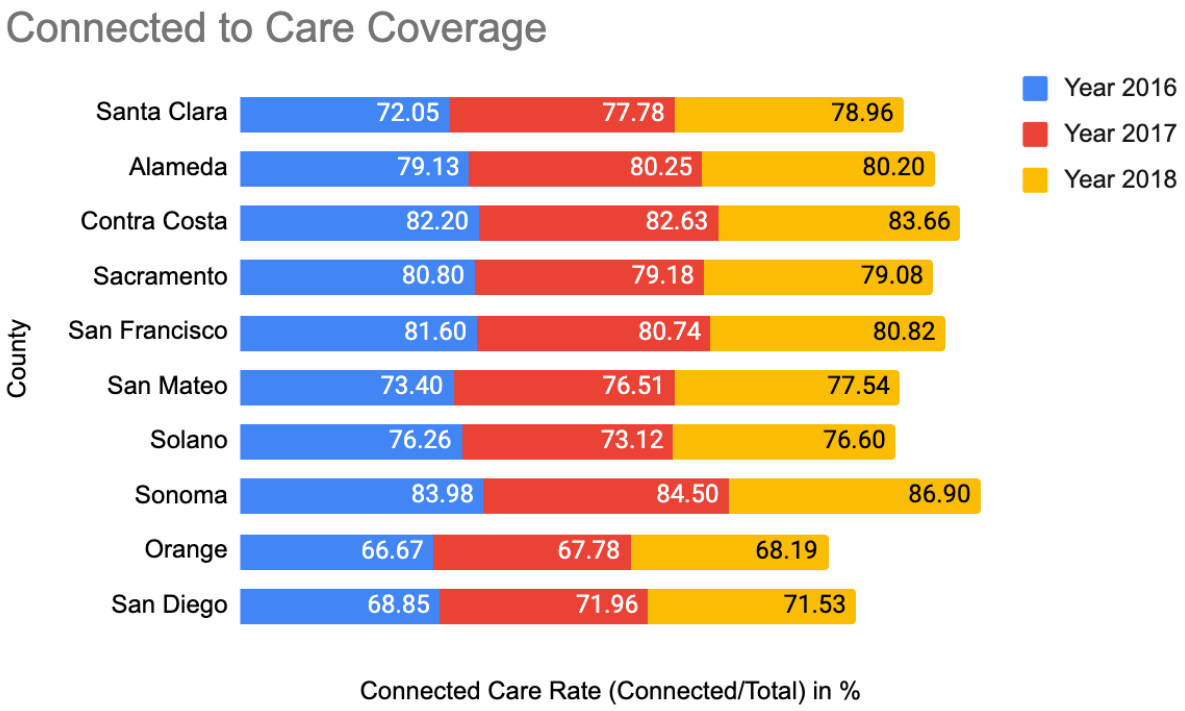
Connected to Care Coverage

Table 5 demonstrates the ratio of the total number of people connected to care to the total number of people living that were identified with HIV (in percentage). The measure is referred to as Connected to Care Coverage. This data is computed using the Continuum of Care two data points, total number of people living with HIV and total linked to care. The table also demonstrates the rate of change in the connected to care coverage data for the years 2016-17 and 2017-18. Net change (in %) column reflects the overall change from 2016-18. Figure 5 is the graphical presentation of Connected to Care Coverage progress for 2016, 2017 and 2018. The figure shows the trends of Connected to Care Coverage for each country from 2016 to 2018.

Table 5: Connected to Care Coverage and Rate of Change in Connected to Care Coverage (2016-17, 2017-18)

County	2016	2017	2018	2016-17	2017-18	Net Change
Northern California						
Santa Clara	72.05	77.78	78.96	**5.74**	**1.18**	**6.92**
Alameda	79.13	80.25	80.20	**1.12**	**-0.04**	**1.08**
Contra Costa	82.20	82.63	83.66	**0.43**	**1.03**	**1.46**
Sacramento	80.80	79.18	79.08	**-1.62**	**-0.10**	**-1.72**
San Francisco	81.60	80.74	80.82	**-0.86**	**0.08**	**-0.78**
San Mateo	73.40	76.51	77.54	**3.11**	**1.03**	**4.14**
Solano	76.26	73.12	76.60	**-3.14**	**3.48**	**0.34**
Sonoma	83.98	84.50	86.90	**0.52**	**2.40**	**2.92**
Southern California						
Orange	66.67	67.78	68.19	**1.12**	**0.41**	**1.53**
San Diego	68.85	71.96	71.53	**3.11**	**-0.43**	**2.68**

Figure 5: Connected to Care Coverage (2016, 2017, 2018)



Key findings of Table 5 and Figure 5

The Connected to Care Coverage findings point towards a positive trend in the majority of counties except Sacramento and San Francisco. A positive net change was observed in eight out of ten counties analyzed. This ratio indicates the percentage of people who were successfully connected to care out of the total identified living with HIV. Consistent positive results for both years mean that the county is able to connect more people to care each year.

Sacramento was the only county which showed a decline in connected to care coverage ratio in both the years. The percentage of people connected to care went down from 80.80% to 79.18% in 2016-17 and again dropped slightly to 79.08% in 2017-18. The net change from 2016-18 was -1.72%. Similarly, San Francisco also exhibited an overall decline with net change of -0.78%. For San Francisco, the percentage of people connected declined from 81.60% to 80.74%

in 2016-17, but went slightly up (80.82%) from 2017-18. It needs to be highlighted that the decline in both the counties is not significantly high.

Solano and Alameda county data also depicted inconsistent patterns between 2016-17 and 2017-18. In Solano county, the connected care coverage declined from 76.26% to 73.12% in 2016-17 but recovered to 76.60% in 2018. In Alameda, on the other hand, reverse trend was observed. The connected care coverage increased in 2016-17 from 79.13% to 80.25% and then slightly decreased to 80.20% in 2018. In both counties the net change however remained positive. Overall from 2016-18, both counties have been successful in connecting more people to care.

One of the highlights of this finding is the significant progress that has been observed in Santa Clara County with maximum positive net change of +6.92% occurring across 2016-18. This indicates that the county is able to connect a greater number of people to care overall compared to the other counties.

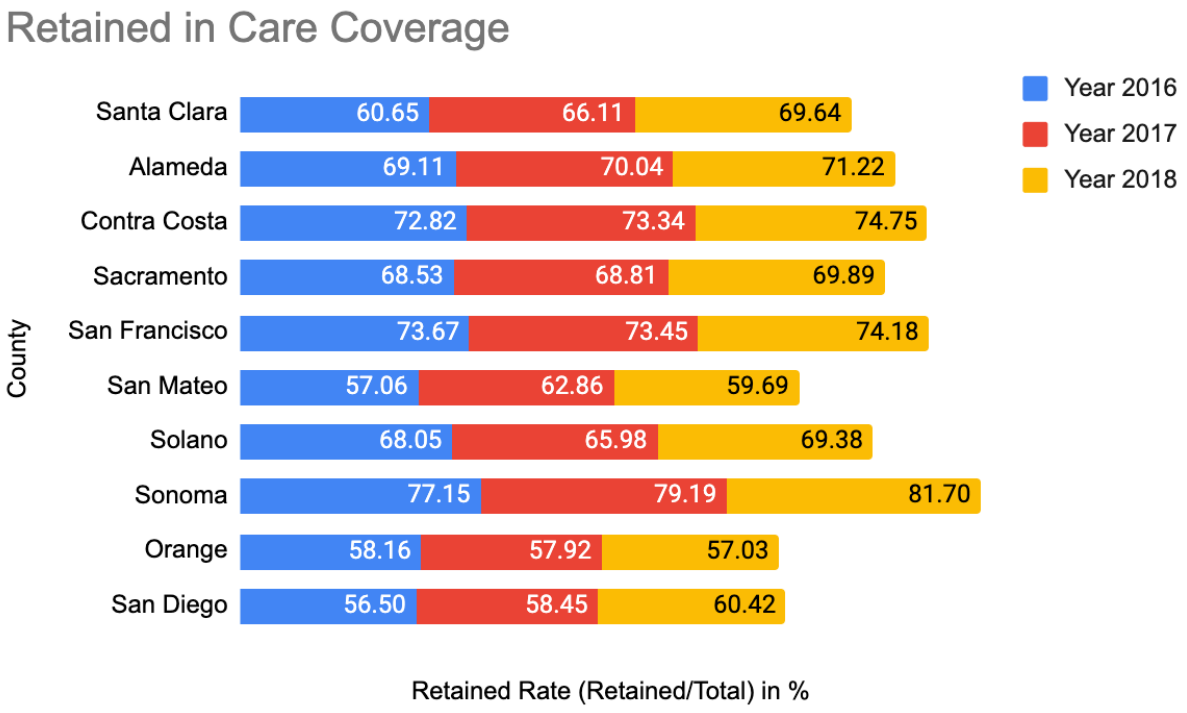
Retained in Care Coverage

Table 6 demonstrates the ratio of the total number of people retained in care to the total number of people living that were identified with HIV (in percentage). The measure is referred to as Retained in Care Coverage. This data was computed using the continuum of care two data points, total number of people living with HIV and total retained in care. The table also demonstrates the rate of change in the retained in care coverage data for the years 2016-17 and 2017-18. Net change (in %) column reflects the overall change from 2016-18. Figure 6 is the graphical presentation of Retained in Care Coverage data for 2016, 2017 and 2018. The figure shows the trends of Retained in Care Coverage for each country from 2016 to 2018.

Table 6: Retained in Care Coverage and Rate of Change in Retained in Care Coverage (2016-17, 2017-18)

County	2016	2017	2018	2016-17	2017-18	Net Change
Northern California						
Santa Clara	60.65	66.11	69.64	**5.45**	**3.54**	**8.99**
Alameda	69.11	70.04	71.22	**0.93**	**1.17**	**2.10**
Contra Costa	72.82	73.34	74.75	**0.52**	**1.41**	**1.93**
Sacramento	68.53	68.81	69.89	**0.28**	**1.09**	**1.36**
San Francisco	73.67	73.45	74.18	**-0.22**	**0.73**	**0.51**
San Mateo	57.06	62.86	59.69	**5.80**	**-3.18**	**2.63**
Solano	68.05	65.98	69.38	**-2.06**	**3.39**	**1.33**
Sonoma	77.15	79.19	81.70	**2.04**	**2.51**	**4.55**
Southern California						
Orange	58.16	57.92	57.03	**-0.24**	**-0.90**	**-1.14**
San Diego	56.50	58.45	60.42	**1.96**	**1.97**	**3.93**

Figure 6: Retained in Care Coverage (2016, 2017, 2018)



Key findings of Table 6 and Figure 6

The Retained in Care Coverage findings point towards a positive trend that has been observed in all of the counties except Orange. A positive net change has been observed in nine out of ten counties analyzed. This ratio indicates the percentage of people who were successfully retained in care out of the total identified living with HIV. Positive results mean that the county is able to retain more people in care each year.

Orange was the only county which showed a decline in retention in care coverage ratio in both the years. The percentage of people retained to care went down from 58.16% to 57.92% in 2016-17 and again dropped slightly to 57.03% in 2017-18. The net change from 2016-18 being -1.14%.

San Francisco has exhibited a consistent pattern each year, with a retention rate of ~73% each year. San Mateo county displayed an increase in retention from 2016-17 from 57.06% to 62.86% but the retention rate declined in 2017-18 from 62.86% to 59.69%. The Solano county retention rate decreased during 2016-17 from 68% to 65.98% but increased in 2017-18 from 65.98% to 69.38%. Noticeably, in spite of inconsistencies, net retention rate, however, remained positive. This means that overall these counties have been successful in retaining more people in care.

One of the highlights of the finding is the significant progress that has been observed in Santa Clara County, with maximum positive net change of 8.99% occurring across 2016-18. This indicates that the county is able to retain a greater number of people in care overall compared to the other counties.

By comparing the Connected to Care Coverage data and Retention in Care Coverage data, it is observed that larger gap exists in retention coverage than Connection Coverage. This implies that counties are able to connect more HIV positive people to care, but are not successful in retaining people in care long-enough to achieve viral-suppression.

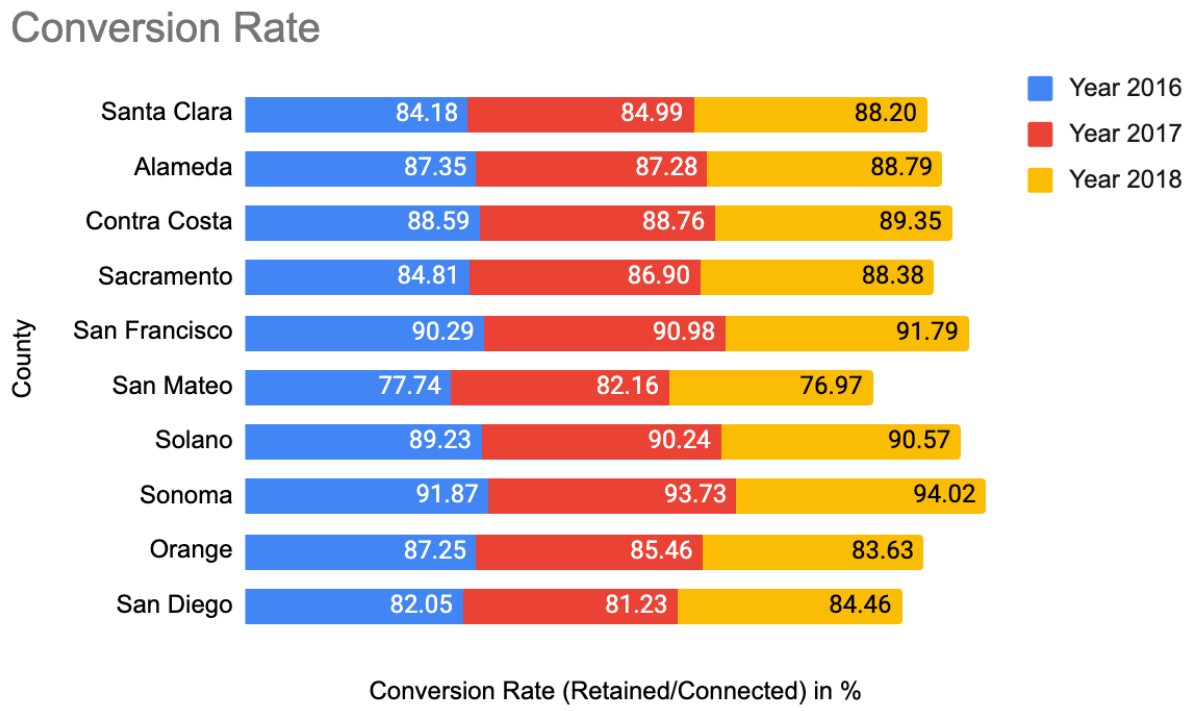
Conversion Rate

Table 7 demonstrates the ratio of the total number of people retained in care to the total number of people connected to care. The measure is referred to as Conversion Rate (Retained in Care: Connected to Care). This data is computed using the Continuum of Care two data points, total number of people linked to care and total retained in care. The table also demonstrates the rate of change in the conversion rate that occurred from 2016-17 and 2017-18. Net change (in %) column reflects the overall change from 2016-18. Figure 7 is the graphical presentation of Conversion rate data for 2016, 2017, and 2018. The figure shows trends of Conversion rate for each county from 2016 to 2018.

Table 7: Conversion Rate and Rate of Change in Conversion Rate (2016-17, 2017-18)

County	2016	2017	2018	2016-17	2017-18	Net Change
Northern California						
Santa Clara	84.18	84.99	88.20	**0.80**	**3.21**	**4.01**
Alameda	87.35	87.28	88.79	**-0.06**	**1.51**	**1.45**
Contra Costa	88.59	88.76	89.35	**0.17**	**0.59**	**0.76**
Sacramento	84.81	86.90	88.38	**2.08**	**1.48**	**3.57**
San Francisco	90.29	90.98	91.79	**0.69**	**0.81**	**1.51**
San Mateo	77.74	82.16	76.97	**4.42**	**-5.19**	**-0.77**
Solano	89.23	90.24	90.57	**1.01**	**0.33**	**1.34**
Sonoma	91.87	93.73	94.02	**1.86**	**0.29**	**2.15**
Southern California						
Orange	87.25	85.46	83.63	**-1.79**	**-1.83**	**-3.62**
San Diego	82.05	81.23	84.46	**-0.83**	**3.24**	**2.41**

Figure 7: Conversion Rate (2016, 2017, 2018)



Key findings of Table 7 and Figure 7

The findings of the Conversion Rate ratio point towards a positive trend that has been observed in the majority of the counties, except Orange and San Mateo. A positive net change has been observed in eight out of ten counties analyzed. Positive results mean that the county is able to retain more people in care each year.

Orange County is the only exception, with a conversion rate decrease from 87.25% to 85.46% during 2016-17 and then further to 83.63% in 2018. This trend reflects that Orange County was not successful in retaining people in care long enough to attain viral suppression after they are connected to care. Also, the percentage of people that the county is able to retain has been declining each year. A net decline of 3.62% has been observed across 2016-18. Similarly, in San Mateo also a negative net change of -0.77% has been observed. But the results have been inconsistent in this case. A rise in the conversion rate was observed during 2016-17, from 77.74% to 82.16%.

However, during 2017-18 a decline from 82.16% to 76.97% was observed.

Data also shows that in Santa Clara County the net change in conversion rate is the highest, with the value of 4% across 2016-18. This is followed closely by Sacramento County, which shows a net change in the conversion rate of 3.57% across 2016-18. This implies that in these counties, once a person is connected to care, there is a higher probability of that person remaining in care, and making progress towards developing a viral-suppression and becoming untransmittable.

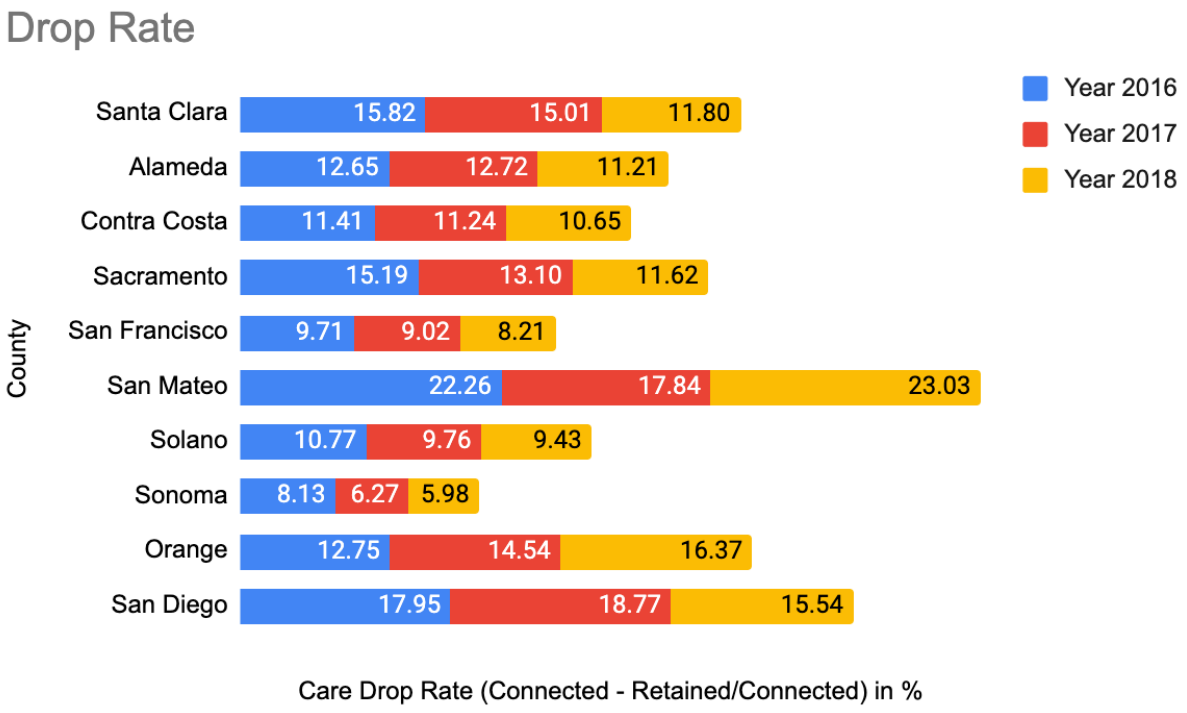
Drop Rate

Table 8 represents the percentage of the HIV cases that dropped out of the retain in care classification. The measure is referred to as Drop Rate. In a zero-sum sense, Drop Rate is the inverse of the Conversion Rate described above. The table also demonstrates the rate of change in the Drop Rate that occurred from 2016-17 and 2017-18. Net change (in %) column reflects the overall change from 2016-18. Figure 8 is the graphical presentation of the Drop Rate data for 2016, 2017, and 2018. The figure shows trends of Drop Rate for each county from 2016 to 2018.

Table 8: Drop Rate and Rate of Change in Drop Rate for 2016-17, 2017-18

County	2016	2017	2018	2016-17	2017-18	Net Change
Northern California						
Santa Clara	15.82	15.01	11.80	**-0.80**	**-3.21**	**-4.01**
Alameda	12.65	12.72	11.21	**0.06**	**-1.51**	**-1.45**
Contra Costa	11.41	11.24	10.65	**-0.17**	**-0.59**	**-0.76**
Sacramento	15.19	13.10	11.62	**-2.08**	**-1.48**	**-3.57**
San Francisco	9.71	9.02	8.21	**-0.69**	**-0.81**	**-1.51**
San Mateo	22.26	17.84	23.03	**-4.42**	**5.19**	**0.77**
Solano	10.77	9.76	9.43	**-1.01**	**-0.33**	**-1.34**
Sonoma	8.13	6.27	5.98	**-1.86**	**-0.29**	**-2.15**
Southern California						
Orange	12.75	14.54	16.37	**1.79**	**1.83**	**3.62**
San Diego	17.95	18.77	15.54	**0.83**	**-3.24**	**-2.41**

Figure 8: Drop Rate (2016, 2017, 2018)



Key findings of Table 8 and Figure 8

Table 8 and Figure 8 shows the percentage of people who dropped out of care without achieving viral suppression. The findings of the net change in the Drop Rate depicted declining trends in eight out of ten counties during 2016-2018. Positive net change in Drop Rate was observed in Orange and San Mateo County. Positive Drop Rate implies that more people are falling out of care after being connected.

Looking at the data closely, it can be observed that the Drop Rates (people dropping out of care) have increased consistently in Orange County in both the years. Drop Rate increased from 12.75% to 14.54% from 2016-17 and then increased to 16.37% in 2018. Overall, the net increase observed was 3.62%. In San Mateo, the pattern observed was inconsistent. A significant decrease in the Drop Rate was observed during 2016-17 from 22.26% to 17.84%. However, during the year

2017-18 the Drop Rate increased from 17.84% to 23.03%. The net change was +0.77% across 2016-18.

Overall, looking at the net change in the Drop Rate from 2016-18, the picture looks positive. Negative Drop Rates, that is decline in the number of people dropping out of care, have been observed in eight out of ten counties analyzed. Data also shows that in Santa Clara County the net Drop Rate is the least, with the value of -4% compared to other counties. This is followed closely by Sacramento County with a net change in the Drop Rate of -3.57%. This implies that these counties are able to prevent more people from dropping out of treatment once connected to care.

Per Capita Funding

The raw data used to calculate the funding per capita has been included in Appendix A and Appendix B at the end of the report**.** Table 9 and Table 10 demonstrate the results of the funding per capita in dollar amounts. Figure 9, Figure 9.1, Figure 10, and Figure 10.1 incorporate the results of Table 9 and Table 10 to determine whether any correlation exists between funding and the outcomes identified through analyzing the Continuum of Care data.

Appendix A represents the table showing the Centers for Disease Control and Prevention (CDC) funds allocation to each county, either directly through CDC or through the state. This is a five-year funding allocated for the GTZ related activities to each county based on prevalence of the HIV disease. The data was provided by the California Department of Public Health for all counties except San Francisco. As San Francisco receives the funding directly through the CDC, the data was gathered from the CDC funding report available at the CDC website. Also, San Mateo did not receive any funding from the state during this time frame and hence it has not been considered during the analysis. The two measures computed are i) funding per capita in thousands (total funding /total population X 1000), and ii) total funding per person living with diagnosed HIV (total funding/ PLWDH). Appendix B contains the table showing the total population of each county. The data for the population is gathered through the United States Census Bureau report. To calculate the per capita with respect to the total number of people living with diagnosed HIV, data represented in Table 1 has been used. Table 1 demonstrates the People Living with Diagnosed HIV (PLWDH) in the ten counties of California for the year 2016, 2017, and 2018.

Table 9 and Table 10 demonstrate the result of the funding per capita. Table 9 shows the funding per capita in thousands calculated on the basis of total population for each county, except

San Mateo. Table 10 shows the per capita calculated on the basis of the PLWDH for each county, except San Mateo.

Figure 9, Figure 9.1, Figure 10, and 10.1 determine whether any correlation exists between per capita funding and the outcomes identified by analyzing the Continuum of Care data. The results of the per capita amount presented in Table 9 and Table 10 are used to determine correlation that exists between the data measures of the continuum of care (number of people connected to care and the number of people retained in care) and funding that each county receives. For the purposes of establishing correlation, average values have been used for all the measures (funding, PLWDH, and total population).

Figure 9 shows the result of correlation established between the number of people connected to care with the per--capita in thousands expenditure calculated with respect to the total population. Figure 9.1 shows the results of correlation established between the number of people connected to care with the per capita expenditure calculated with respect to the total PLWDH.

Figure 10 shows the results of correlation established between the number of people retained in care with the per-capita in thousands expenditure calculated with respect to the total population. Figure 10.1 shows the results of correlation established between the number of people retained in care with the per capita expenditure calculated with respect to the total PLWDH.

Table 9: Per Capita with respect to the Total Population for each Year

(CDC Funding / Total Population* 1000) in $ amount.

County	2016	2017	2018
Northern California			
Santa Clara	264	264	263
Alameda	552	550	547
Contra Costa	334	331	330
Sacramento	409	405	402
San Francisco	2183	2167	2157
San Mateo	0	0	0
Solano	383	379	377
Sonoma	374	374	376
Southern California			
Orange	319	318	318
San Diego	554	551	548

Table 10: Per Capita with respect to People Living with Diagnosed HIV (PLWDH) for each year (CDC Funding / PLWDH) in $ amount.

County	2016	2017	2018
Northern California			
Santa Clara	151	146	144
Alameda	144	142	143
Contra Costa	146	143	137
Sacramento	142	140	139
San Francisco	142	146	150
San Mateo	0	0	0
Solano	127	128	127
Sonoma	124	126	127
Southern California			
Orange	140	139	139
San Diego	134	132	132

Figure 9 Correlation for Per-Capita in Thousands by Total Population to Connected to Care Outcome (Pearson Correlation Coefficient R: 0.58)

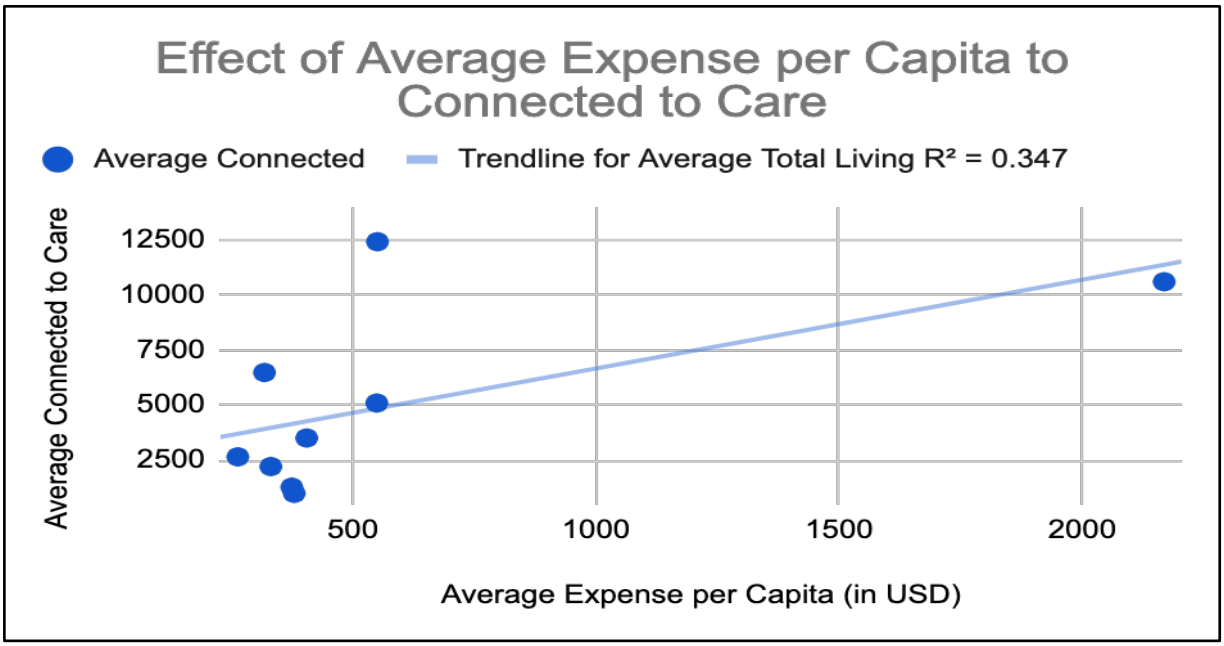


Figure 9.1 Correlation for Per-Capita in Thousands by Total Population to Retention in Care Outcome (Pearson Correlation Coefficient R: 0.60)

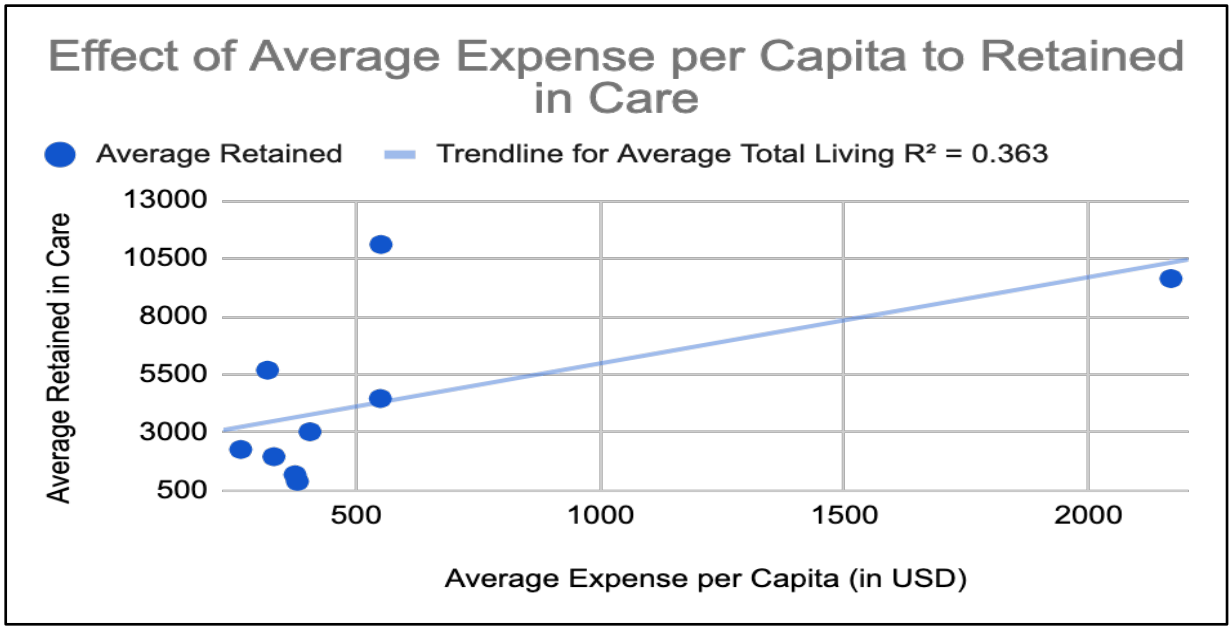


Figure 10 Correlation for Per Capita by Total PLWDH to Connected to Care Outcome

(Pearson Correlation Coefficient R: 0.10)

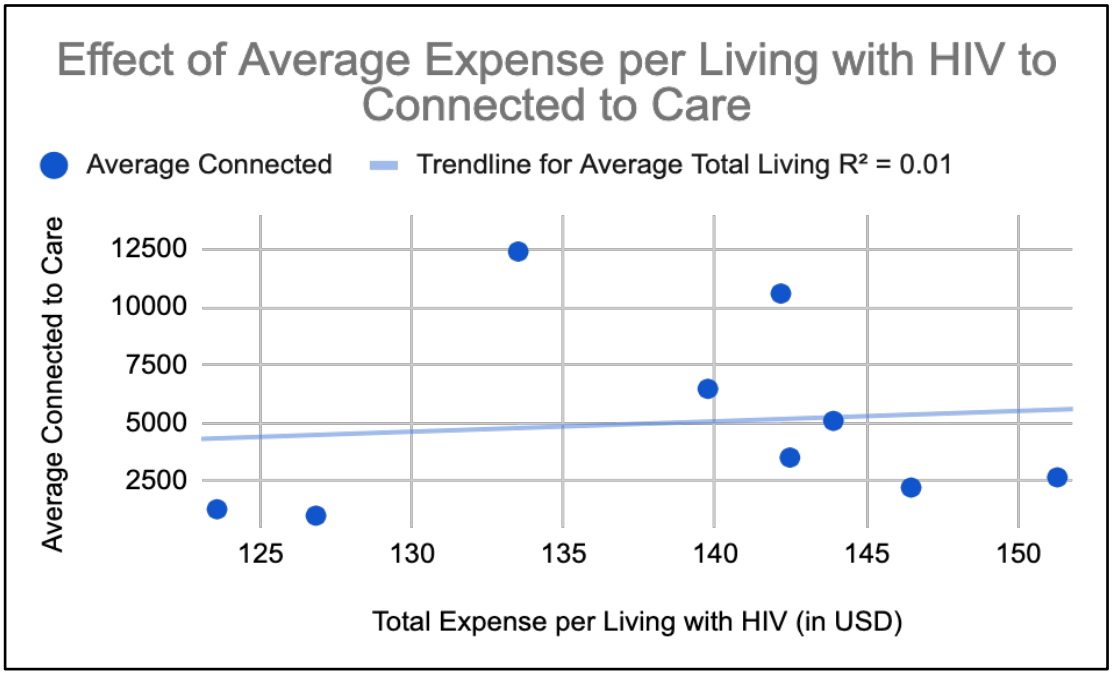
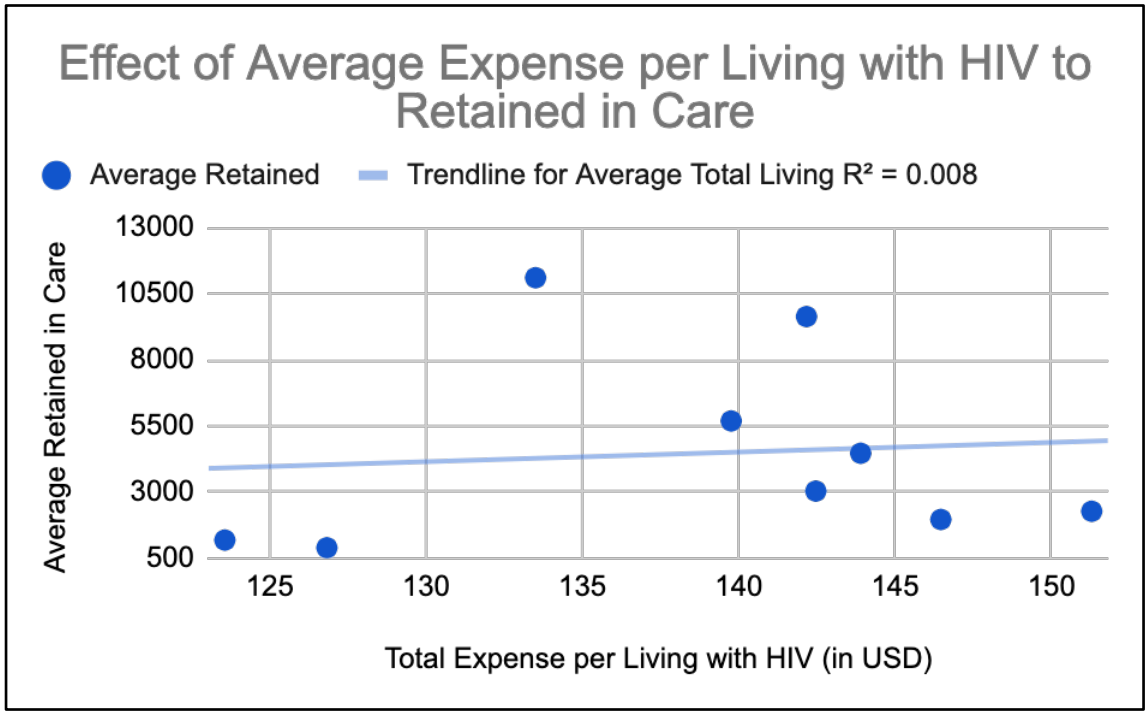


Figure 10.1 Correlation for Per Capita by PLWDH to Retention in Care Outcome

(Pearson Correlation Coefficient R: 0.09)



Key findings of Figure 9 and 9.1 and Figure 10 and 10.1

The finding of correlational study demonstrated a moderately strong positive correlation between the funding per capita in thousands with respect to the total population and the outcomes of the Continuum of Care (number of people connected to care R = 0.58 and the number retained in care R= 0.60, respectively) depicted in Figure 9 and Figure 9.1. On the other hand, a weak although positive correlation was observed between per capita funding availability with respect to the PLWDH and the outcomes of the Continuum of Care (number of people connected to care R = 0.10 and the number retained in care R= 0.09, respectively) depicted in Figure 10 and Figure 10.1. The moderately strong positive finding points towards a moderately significant positive relationship between funding and outcomes based on total population. On the other hand, a weak correlation suggests that more funding to counties with high prevalence of the disease (PLWDH) have almost negligible correlation with better outcomes.

ANALYSIS AND DISCUSSION

This analysis discusses the findings of the HIV statistics and Continuum of Care data and highlights the overall trends observed across counties. Various strategies adopted under the GTZ initiative are discussed to understand their contributions towards the positive trends. The counties exhibiting consistent negative results have also been examined to understand the underlying factors responsible for these results. Another key dimension discussed is the per capita funding and its impact on the GTZ outcomes across counties. Additionally, some external factors have been illustrated to explain the gaps and inconsistencies observed in the findings. The aim of this project is to highlight positive trends and examine the outcomes of the GTZ initiative in Santa Clara County in comparison to results of other counties. The funding per capita analysis will help to decide a recommendation for continuation of the funding for the local GTZ efforts in Santa Clara County. However, this project does not intend to establish any causality for the outcomes.

People Living with Diagnosed HIV

People living with diagnosed HIV (PLWDH) are indicative of the total number of people who are aware of their HIV status. The desirable result of this measure is to have an increase in the number of PLWDH. This measure is critical, as it is estimated that 23% of the new infections get transmitted by individuals who are unaware of their infectious status (Fauci, Redfield, Sigounas, Weahkee, & Giroir, 2019). An increase of PLWDH reflects that more people are coming forward for HIV testing. However, the measure cannot conclude whether people with positive HIV status will opt for care. According to the findings of this project, positive trends have been observed, with an increase in the number of PLWDH in eight out of the ten counties, after the adoption of the GTZ initiative.

San Francisco and Sonoma were the two counties which demonstrated a consistent decline in the PLWDH in both the years. This result can be partly attributed to the increase in the number of deaths observed in both counties during the same time period. The other potential factors can be the demographics of the county, especially the conservative population who fear the HIV positive diagnoses (Allday, 2016; Bauman, 2019). The huge stigma and discrimination associated with the disease also prevent people from coming forward for HIV testing (Haghdoost & Karamouzian, 2012). The homeless population, known to be high in San Francisco, is more susceptible to the disease, difficult to diagnose, connect, and retain in care (Reynolds, 2019; Bauman, 2019). However, no causality can be concluded based on the findings of this report.

Number of New Infections

The number of new infections is indicative of the number of people who are newly diagnosed with the disease. A key goal of GTZ is to reduce the number of new infections in each county, therefore, the desirable result of this measure is to have a decline in the new diagnosis. A decline in the number of new diagnoses is indicative of a reduced spread of infection in the community. This implies that the people who are being tested positive for the disease are able to reach a viral suppression and are not contributing to new infections. It is an indication that a county is able to successfully connect and retain people in care (therapy), or that there has been an improvement in PrEP/PEP access. According to the findings of this project, a significant decrease in the number of new infections was observed in eight out of the ten counties. Santa Clara and Solano were the two counties that exhibited an increase in both years.

In Santa Clara County, this shift could be partly attributed to the GTZ strategies adopted through its local plan. The local plan is highly focused on increasing awareness, access to testing, and reducing stigma. This might be helping more people to come forward for HIV testing, resulting

in a high number of new diagnoses. The local plan was launched in 2016 (along with the state plan) so these might be the initial trends. Continued monitoring in coming years will shed light on any spikes in new cases relative to true trends. In Solano county the shift could be attributed to more people being identified as a result of the state's GTZ initiative, with strategies to reduce HIV-related disparities and increase access to care. A 2014 local news report of Solana County discussed that the county lacked resources to reach out to everyone suffering with HIV and provide care (Widjojo, 2014). With the launch of GTZ in 2016, the improved system might have enabled diagnosis of new cases at a higher rate.

Number of Deaths

This measure is indicative of the number of people who died in a county as a result of HIV/AIDS or AIDS related illnesses. A desirable result for this measure is to have a decrease in the number of deaths. Most of the counties did not exhibit any clear, consistent pattern with respect to this measure. Inconsistencies were observed in all counties except Orange County, which showed an increase in both the years. As the data availability allows research to analyze only the changes occurring from 2016 to 2018, it seems to be a short period for any reliable pattern to emerge. The number of deaths may be high in a county as a result of late diagnosis or a large number of patients existing at an advanced stage of the disease. As no data is available on the number of late diagnoses/or people living at the advanced stages of the disease, no clear conclusion can be drawn.

Orange County was the only one county that presented a consistent increase in the number of deaths in both years. For Orange, this result can be explained by its retention in care data. It is the only county that also displayed a consistent increase in the Dropout Rate. The people who are dropping out of care may be progressing to the advanced stages of the disease and might be

contributing to the increased number of deaths. However, no conclusive remarks can be made at this time to determine the causality as other contributing factors might also be playing a role.

Continuum of Care

Continuum of Care includes three measures, i) total number of people living with HIV, ii) number of people linked to care, and iii) number of people retained in care. The desired result of this measure for any county is to have a system in place to diagnose more people, successfully connect all to care, and retain all in care; to decrease the burden of the disease in the community.

The finding shows that gaps exist at both the stages in all counties; in the number of people who are connected to care of the total identified, and the number who are retained in care out of those connected. This dropout percentage is critical, as these people act as potential carriers of the disease, resulting in continued spread of the infection. These dropout percentages can also contribute to the increase in the number of deaths occurring in a county, as these people might progress to advanced stages of AIDS disease. However, it needs to be highlighted that all the counties have made progress towards reducing these gaps since the launch of GTZ.

Linkage to care

After the launch of GTZ, most of the counties have shown a consistent progress in the number of people who were successfully connected to care. This implies that strategies of GTZ to build a system where people can get access to care, either through improvement in PrEP/ PEP services or linkage to care, have shown progress.

San Francisco and Sacramento were the two counties that displayed a drop in the number of people connected to care in both the years. Multiple factors can contribute to this negative trend. As the GTZ program with strategies around PrEP and PEP is relatively new, the counties might still be in the process of establishing the services to connect more people to care. However, in San

Francisco the GTZ strategies began in 2014, before the State GTZ initiative was launched, therefore there might be other external factors playing a role (Bauman, 2019). The stigma and discrimination associated with the disease might be making it difficult to connect certain conservative population groups to care (Bauman, 2019). In San Francisco, a large homeless population which is difficult to connect to care might be another reason for this decline (Reynolds, 2019; Bauman, 2019).

Retention in Care

This measure is indicative of the number of people who remain in care and are able to achieve a viral load of ≤ 200 copies/ml (considered as undetectable level). According to the findings of this project, gaps have been observed with people dropping out of care after being connected. However, retention rates have increased overall across years in all counties except Orange County. More people maintaining a viral-suppression reduces their chance of transmitting the disease to another person, thereby reducing the overall community spread. Increased retention rates point towards the promising strategies and support system that have enabled people to overcome HIV related stigma and discrimination and continue to take treatment (retention).

Orange County is the only county that has shown a consistent decline in the retention rates (large number of people dropping out of care after being connected to care) for both years. This decline can be associated with the high number of deaths due to HIV that were reported in the county during the same time frame. It is possible that Orange County had more people in the advanced stages of disease who could not survive to continue in therapy, which resulted in a decline in retention rate. Other external factors can be contributing towards this result as well, such as, the stigma and discrimination associated with the HIV diagnoses, or the demographics of the

county with a large conservative population. An increasing homeless population that has been reported in the past few years, might also be a contributor (Money, Pinho, Davis, & Vega, 2019).

Discussion of Santa Clara County

The County of Santa Clara works in collaboration with the state to follow the state plan (CDPH: OA, 2016). Additionally, to accelerate their AIDS response, the county has also adopted a local GTZ plan based on its local needs in 2016 (SCC: PHD, 2016b). The county has demonstrated consistently improving results from 2016 to 2018 in almost all the categories analyzed- people living with diagnosed HIV, number of deaths reported, people connected to care, and people retained in care. It appears that the strategies established by the county, such as i) improvement in PrEP and PEP access, ii) improvement in guideline-based Sexually Transmittable Infection (STI) screening and HIV testing, iii) reduction in stigma, and iv) increase linkage to care and retention in care have been working well. The results imply that the county has been successful in establishing a system where people are able to overcome the stigma associated with the disease and come forward for HIV testing. The county has established a process where HIV positive individuals receive care, either through improved PrEP/ PEP services or anti-retroviral treatment (linkage to care). A significant increase in the number of people retained in care each year, along with a significant decrease in the dropout rate (people opting out after being connected to care) reflects that the county has a support system in place, where strategies exist to help people overcome HIV related discrimination and continue to stay connected to care (retention). The overall success of the strategies established by the county is also reflected through a net decrease in the death rate that has been observed in the county after the adoption of GTZ.

On the other hand, Santa Clara county also observed a significant increase in the number of new cases in both the years, which was a negative finding identified. However, this shift might

be an initial result observed due to the local plan being highly focused on increasing awareness, access to testing, and reducing stigma. This might be helping more people to come forward for HIV testing, resulting in a high number of new diagnoses. Continued monitoring in coming years will shed light on any spikes in new cases relative to true trends.

Analysis of Per Capita Funding Findings

The per capita funding analysis did not establish any strong correlation between funding and outcomes, however a positive correlation was observed. A positive correlation does not confirm any causality, it only points out that some effective relationship occurs between per capita funding and the outcomes. Based on this finding it can be inferred that more resources might contribute towards good outcomes, but it does not eliminate the role of other contributing factors. This report recognizes that some other funding streams may be associated with HIV prevention efforts that might vary the per capita funding level in different counties. For the purpose of this report, only direct CDC funding or CDC funding allocated through the state has been considered to elucidate the broad picture and understand the correlation.

A weak correlation that was observed between per capita calculated with respect to PLWDH and outcomes appears to be consistent with results obtained so far. This finding can be understood by the varying pattern in outcomes observed in different counties. For example, San Diego and San Francisco both receive high funding based on the prevalence of the disease. However, the outcomes achieved in both counties were varied and inconsistencies were observed. These varying results and gaps point towards the role of other factors.

A moderately strong correlation was observed between the funding per capita based on the total population and outcomes. It supports the fact that more resources might be needed in counties with higher populations for activities like outreach initiatives. Spreading awareness about the PrEP

and PEP availability, and reducing stigma and discrimination associated with the disease are a big part of the GTZ plan. Hence, tapping into new resources to enhance the outreach initiatives, to reach out to more conservative and vulnerable populations, might be a good strategy. Additional resources might help support functions such as getting local community organizations involved, using social media platforms, investing in television commercials, and other actions to improve outreach efforts.

In Santa Clara, the local GTZ initiative is supported by the county funding approved by the Board of Supervisors in the form of mini-grants each year. These grants promote community agencies' abilities to recognize and respond to HIV prevention needs in the county (SCC: GTZ, n.d.a). This additional funding might be supporting the county to conduct more coordinated action through their collective impact approach - enabling better outcomes.

Inconsistencies and Gaps

Based on this analysis, it appears that most of the counties are making progress, through consistent positive results, or showing improvement even if the numbers are still low, or through decrease in the negative results. Some inconsistencies and gaps highlighted in the report can be a result of external contributing factors playing a role. External factors that may be contributing to varied result include issues related to homelessness, health disparity that exists among people of color, stigma and discrimination associated with the disease, lack of resources, propensity of higher prevalence of the disease based on population demographics as in the case of San Francisco, conservative populations, and others. The report acknowledges that every county is unique and faces its own set of challenges in the fight against HIV. These unique factors play a critical role in determining their outcomes.

Limitations

The current data availability permitted analysis for changes that were observed during 2016 to 2018 only. The three years of data analyzed for the purpose of this report might not be sufficient to depict any clear long-term trends. As the program is fairly new, the data on established strategies is also not yet available for all the counties. Most of the counties are in the process of establishing and increasing services like testing for STD's, PrEP and PEP. Therefore, it is difficult to determine any causal-relationship and long-term trends. Simultaneously, multiple external factors also make the issue of HIV more complicated, preventing determination of any clear connections and contributing towards inconsistent results.

CONCLUSION

Based on the analysis, it can be established that the HIV/AIDS response in California has strengthened after the adoption of California's Integrated Surveillance, Prevention and Care Plan: Getting to Zero Initiative. Positive results have started to emerge after the adoption of the new strategies. However, outcomes are influenced by various other contributing factors. It appears that strategies related to zeroing in on stigma and discrimination associated with the disease are critical to improving the overall outcome of the program.

In Santa Clara County, significant progress has been made with evidently promising results emerging in almost all the categories under analysis. It appears, with the support of the Collective-Impact approach adopted through the local GTZ plan, along with the state GTZ initiative in place, that the county is able to achieve better results each year. The picture will become clearer as more data becomes available in the future. The funding per capita analysis indicates that tapping into new resources appears to be a good strategy that can enable counties to enhance outreach efforts to a larger population. Based on this finding, it is recommended that in Santa Clara County, funding for the local GTZ initiative should be extended for another cycle for continued progress. The findings of this project, however, do not intend to make any conclusive remarks and acknowledge that counties face unique challenges in the fight against this disease.

Future Research

The current analysis is based on the changes observed for a three-year duration. As strategies around PrEP/PEP are new, it is imperative that many counties invest their early efforts to build the infrastructure to provide services and spread awareness. For a complex initiative like GTZ, data for longer duration can bring out clearer and consistent trends that will allow the analysis to be more reliable and accurate. Also, as strategies of GTZ will be established, in coming years more

data will be available on multiple dimensions, such as the number of people using PrEP, number of people using PEP, number of tests conducted for sexually transmitted disease and others strategies. This data will be crucial to establish some causal relationship.

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Appendix A

CDC Funding (in $ amount) for each county (2016, 2017, 2018)

County	2016	2017	2018
Northern California			
Santa Clara	509,846	509,846	509,846
Alameda	911,326	911,326	911,326
Contra Costa	379,345	379,345	379,345
Sacramento	618,880	618,880	618,880
San Francisco	1,905,062	1,905,062	1,905,062
San Mateo	Not funded	Not funded	Not funded
Solano	168,305	168,305	168,305
Sonoma	188,194	188,194	188,194
Southern California			
Orange	1,012,569	1,012,569	1,012,569
San Diego	1,832,360	1,832,360	1,832,360

Source: California Department of Public Health: Office of AIDS, n.d; CDC, 2013.

Appendix B

Population of each county (2016, 2017, 2018)

County	2016	2017	2018
Northern California			
Santa Clara	1,929,581	1,933,383	1,937,570
Alameda	1,650,306	1,658,131	1,666,753
Contra Costa	1,137,194	1,144,863	1,150,215
Sacramento	1,511,510	1,527,718	1,540,975
San Francisco	872,795	879,166	883,305
San Mateo	768,204	768,808	769,545
Solano	439,300	443,877	446,610
Sonoma	503,249	503,246	499,942
Southern California			
Orange	3,170,707	3,179,950	3,185,968
San Diego	3,310,280	3,325,468	3,343,364

Source: United States Census Bureau, n.d